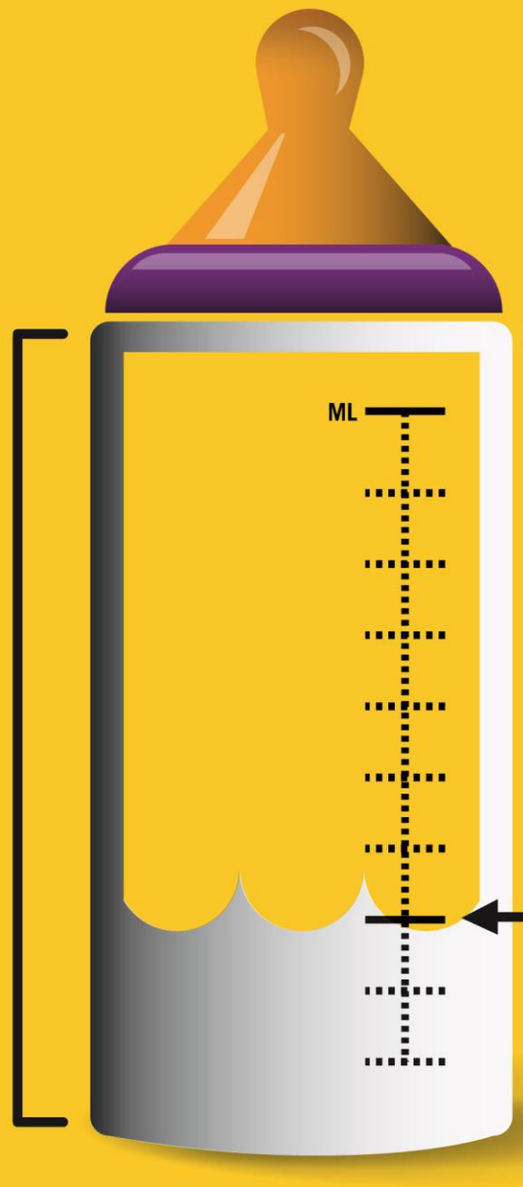
How Old Is The Shepherd?

ROBERT KAPLINSKY

@robertkaplinsky

CHOOSE CAR SEAT:
BY AGE & SIZE

THE NUMBER OF PEOPLE **WHO THINK** THEY HAVE THEIR CHILD IN THE RIGHT SEAT.



THE ONES **WHO ACTUALLY DO.**

KNOW FOR SURE

IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

VISIT SAFERCAR.GOV/THERIGHTSEAT

Ad Council

NHTSA www.nhtsa.gov

Child Car Safety

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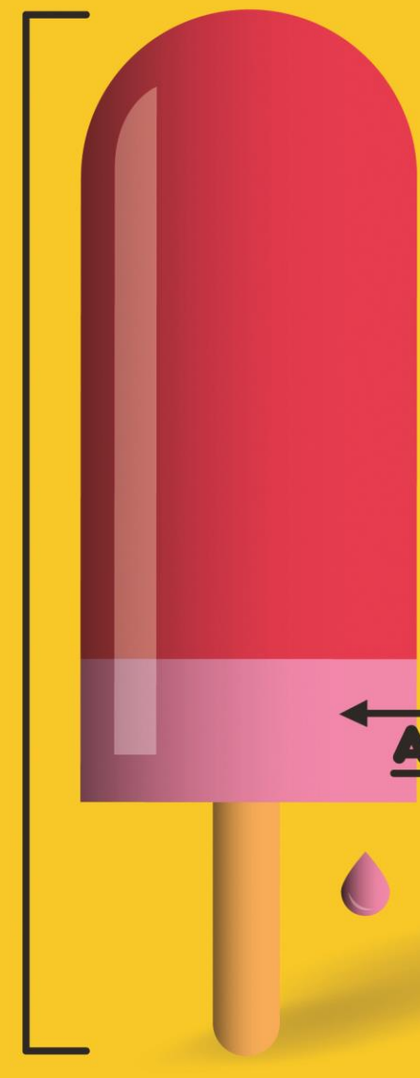

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Child Car Safety

Math Question

- Solve the problem on your own. Do not work or share your answer with anyone else.
- You will have 30 seconds to complete it.
- Write your answer down on a paper.

There are 125 sheep and 5 dogs in a flock. How old is the shepherd?

Of the 32 students I interviewed…

- 75% of them gave me numerical responses
- 2 students calculated the answer to be 130 (125 + 5)
- 2 students calculated the answer to be 120 (125 – 5)
- 12 students calculated the answer to be 25 (125 ÷ 5)
- 0 students calculated the answer to be 625 (125 x 5)
- 4 students stated that they guessed their answer (90, 5, 42, and 50)
- 4 students tried to divide 125 by 5 but could not correctly implement the procedure

Takeaways

- Making sense of mathematics
- Intellectual autonomy
  - Intellectual autonomy is about being able to think for yourself and not being dependent on others for the direction and control of one's thinking.

What Does the NHTSA Say?

Key Statistics and Consumer Insights:

- Motor vehicle crashes are the leading cause of death for children age 1 through 12 years old.[1]

According to a NHTSA study, 3 out of 4 kids are not as secure in the car as they should be because their car seats are not being used correctly.

be reduced by about half if the correct child safety seats were always used.

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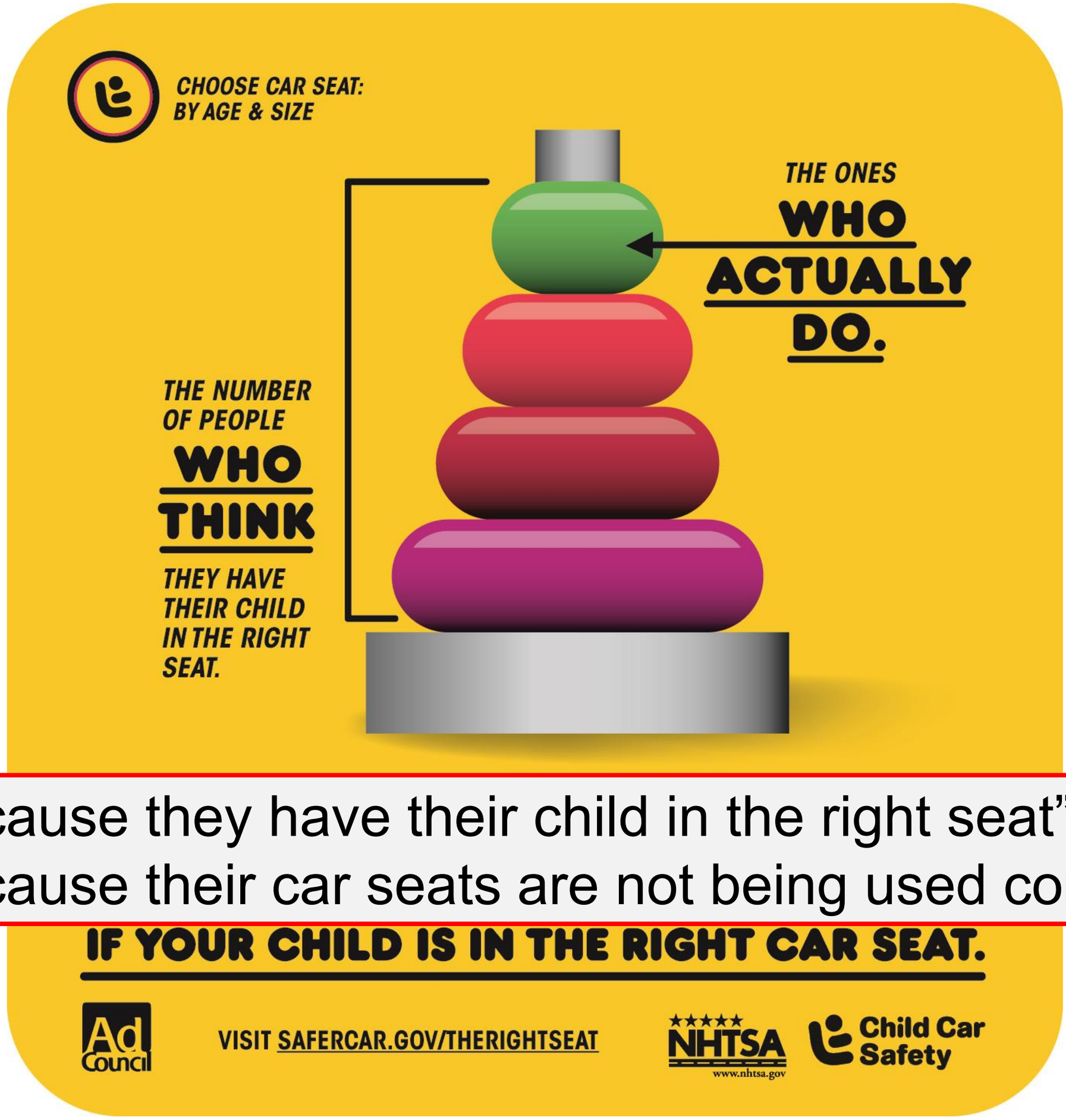
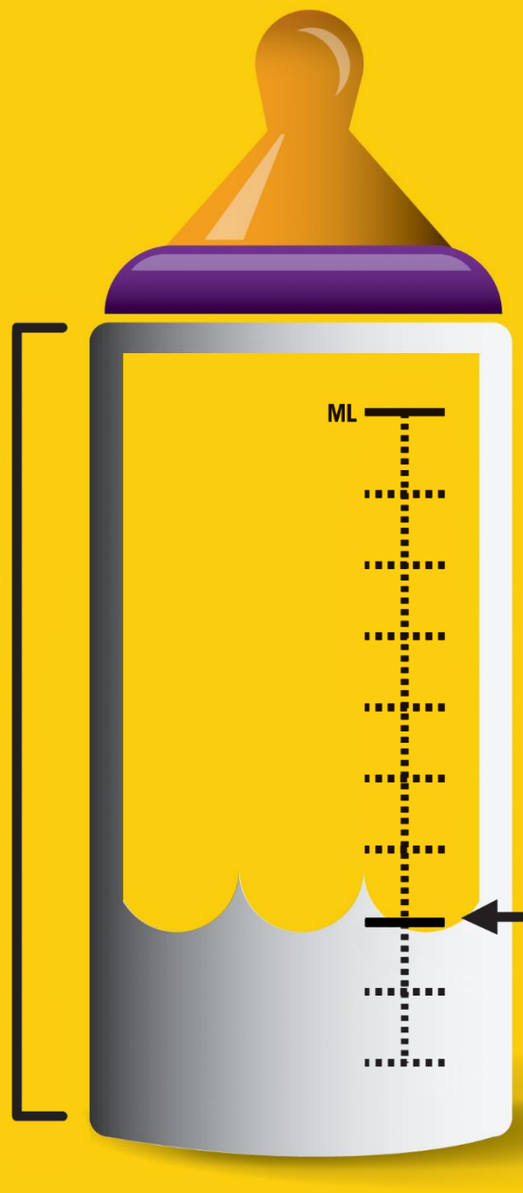
[1] Source: Based on the latest mortality data currently available from the CDC's National Center for Health Statistics.



- “because they have their child in the right seat”
- “because their car seats are not being used correctly”

CHOOSE CAR SEAT:
BY AGE & SIZE

THE NUMBER OF PEOPLE **WHO THINK** THEIR CAR SEATS ARE BEING USED CORRECTLY.



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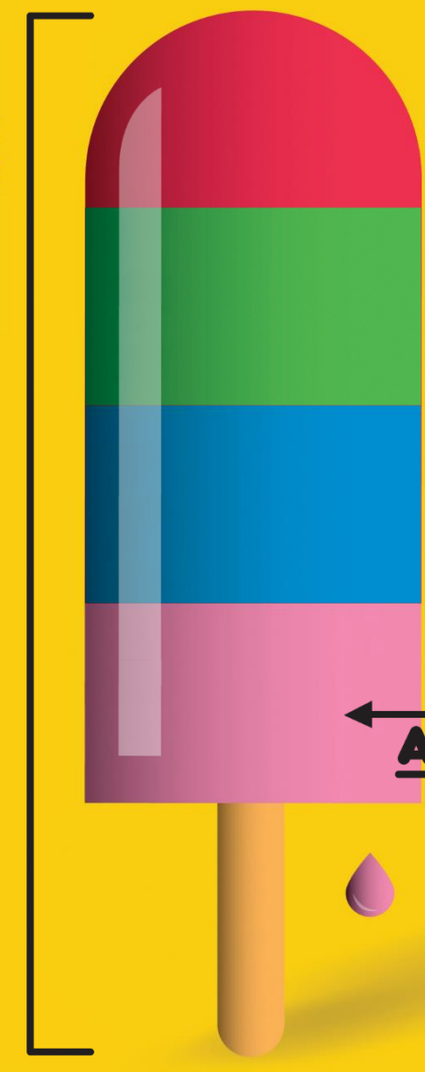

THE ONES **WHO ACTUALLY DO.**

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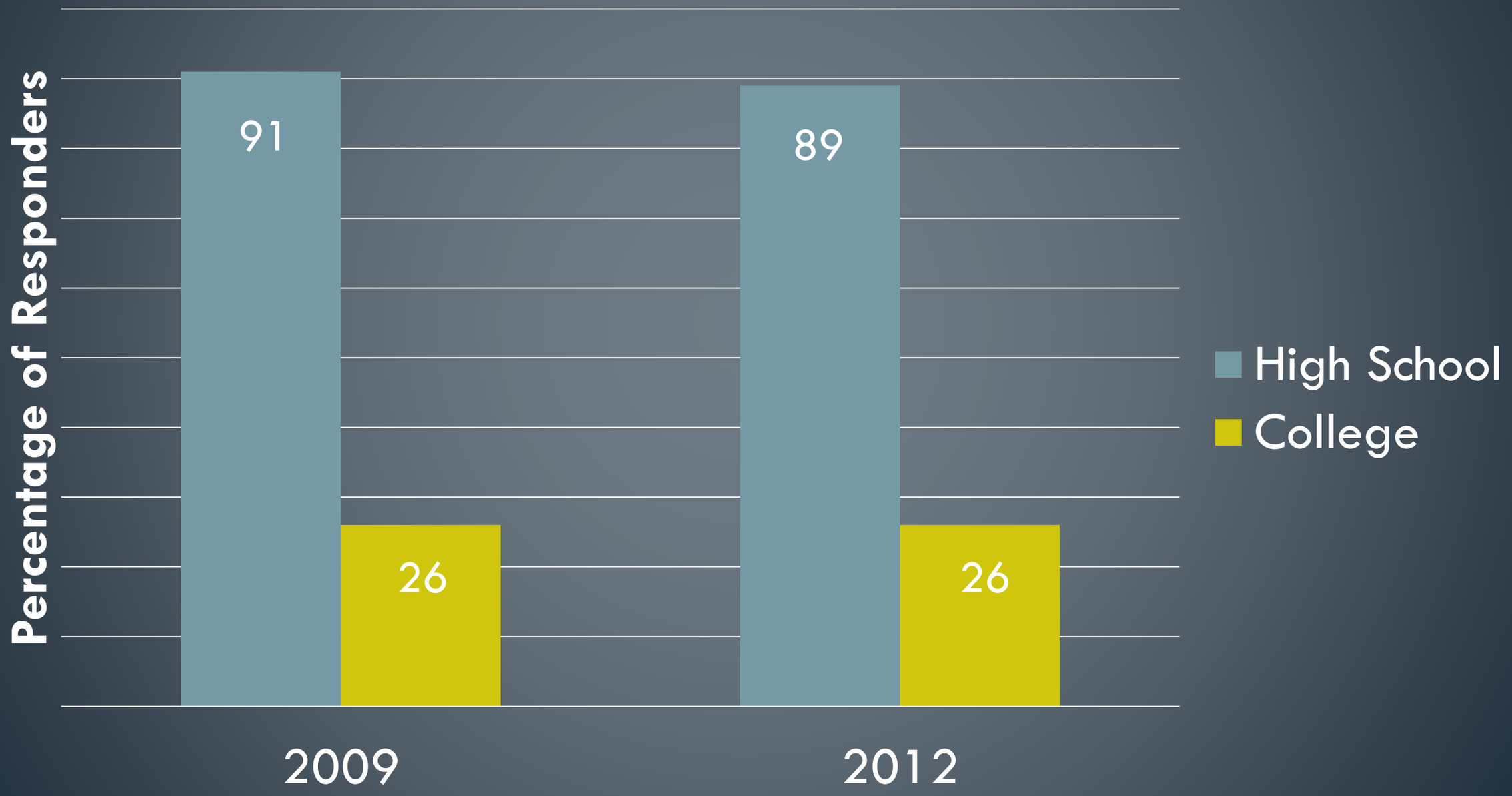
Child Car Safety

WHAT IS THE PURPOSE OF A K-12 EDUCATION?

- *College readiness*
  - *ACT National Curriculum Survey*
  - *Surveyed 9,937 educators*

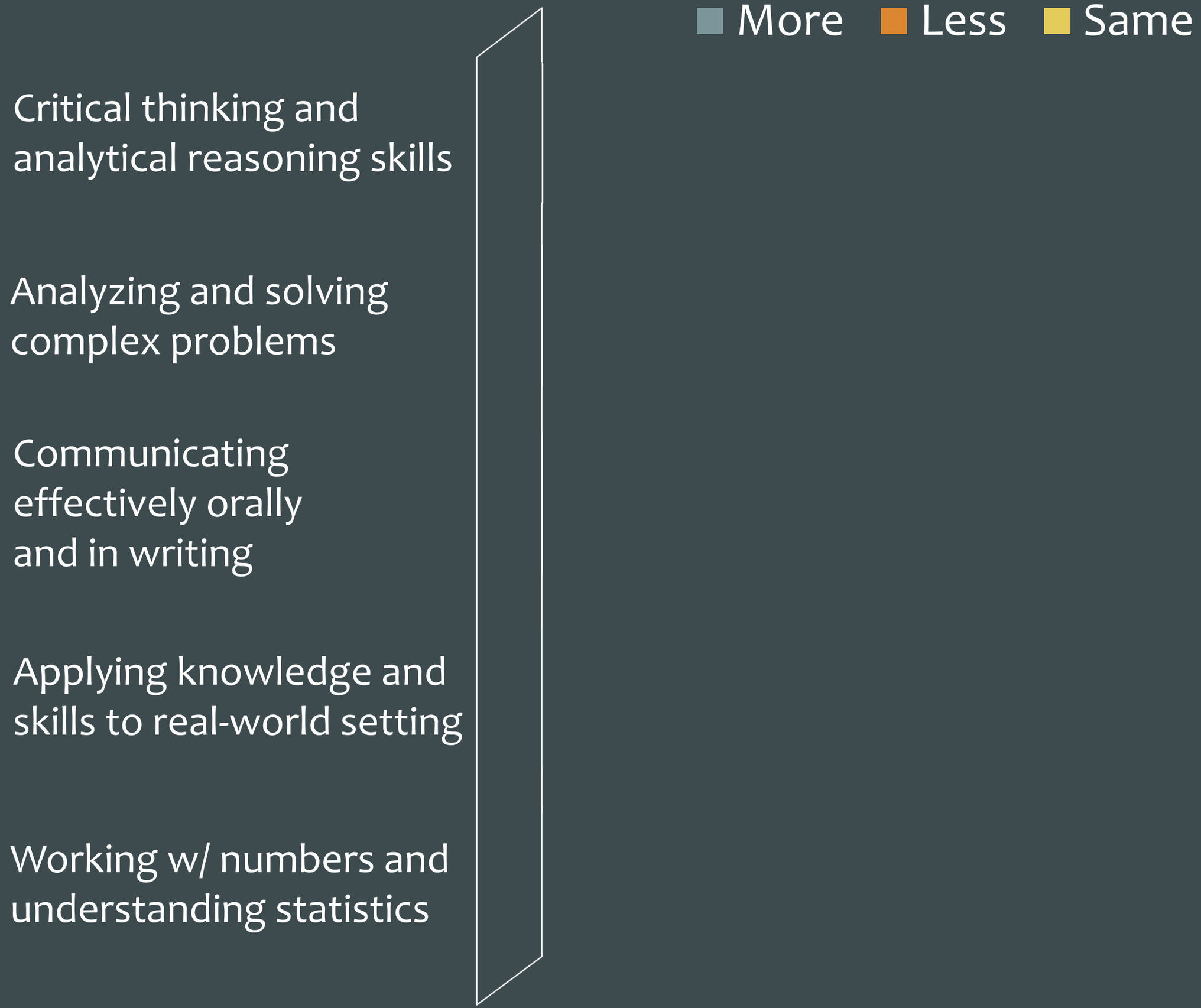
“Well” or “Very Well” Prepared for College



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

WHAT IS THE PURPOSE OF A K-12 EDUCATION?

- *College readiness*
- *Career readiness*
  - *Association of American Colleges and Universities survey*
    - *Surveyed over 300 employers with at least 25 employees and many new hires*



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

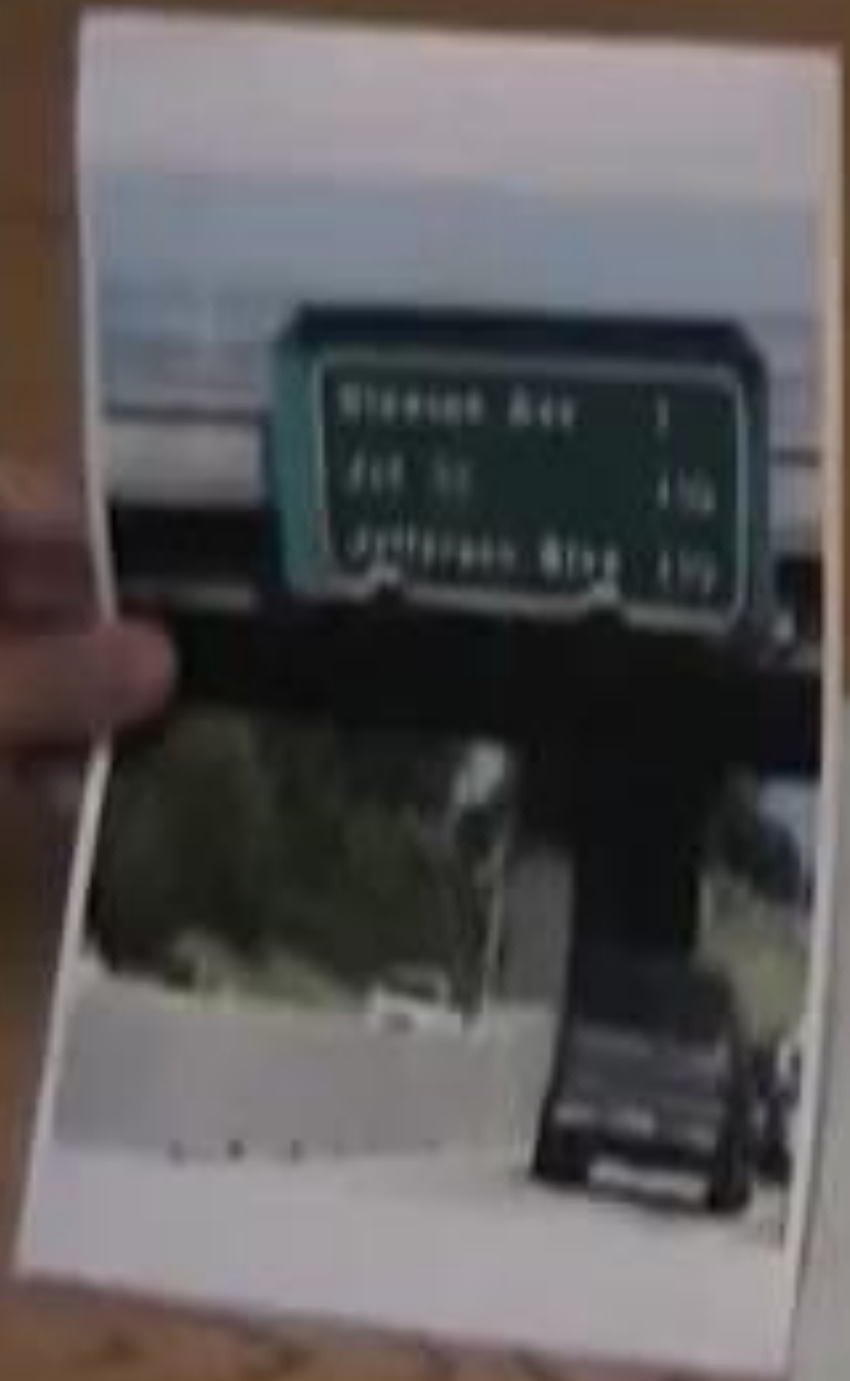
WHAT DOES IT LOOK LIKE…

- when students **can** work with numbers but **cannot**:
  - critically think
  - applying knowledge and skills to real-world settings
  - analyze and solve complex problems

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

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

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



Depth of Knowledge

- What?
- How?

Depth of Knowledge Examples

Perimeter

- DOK 1 – What is the perimeter of a rectangle with that measures 8 units by 4 units?
- DOK 2 – List the dimensions of a rectangle with a perimeter of 24 units.
- DOK 3 – Of all the rectangles with a perimeter of 24 units, which one has the most area?

Surface Area

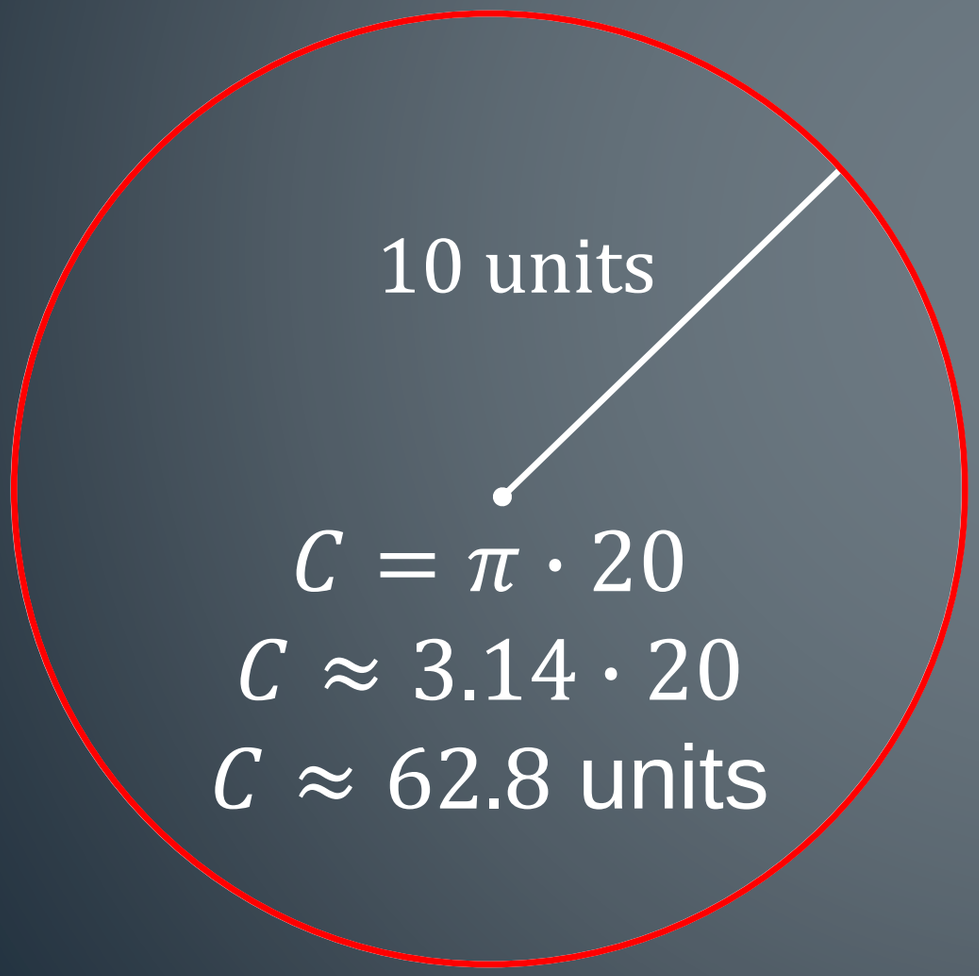
- DOK 1 – What is the surface area of a rectangular prism that measures 8 units by 4 units by 3 units?
- DOK 2 – List the dimensions of a rectangular prism with a surface area of 20 square units.
- DOK 3 – Of all the rectangular prisms with a surface area of 20 square units, which one has the most volume?

Depth of Knowledge

- What?
- How?
- Why?

Depth of Knowledge – Level One

What is the circle's circumference? $\pi \approx 3.14$



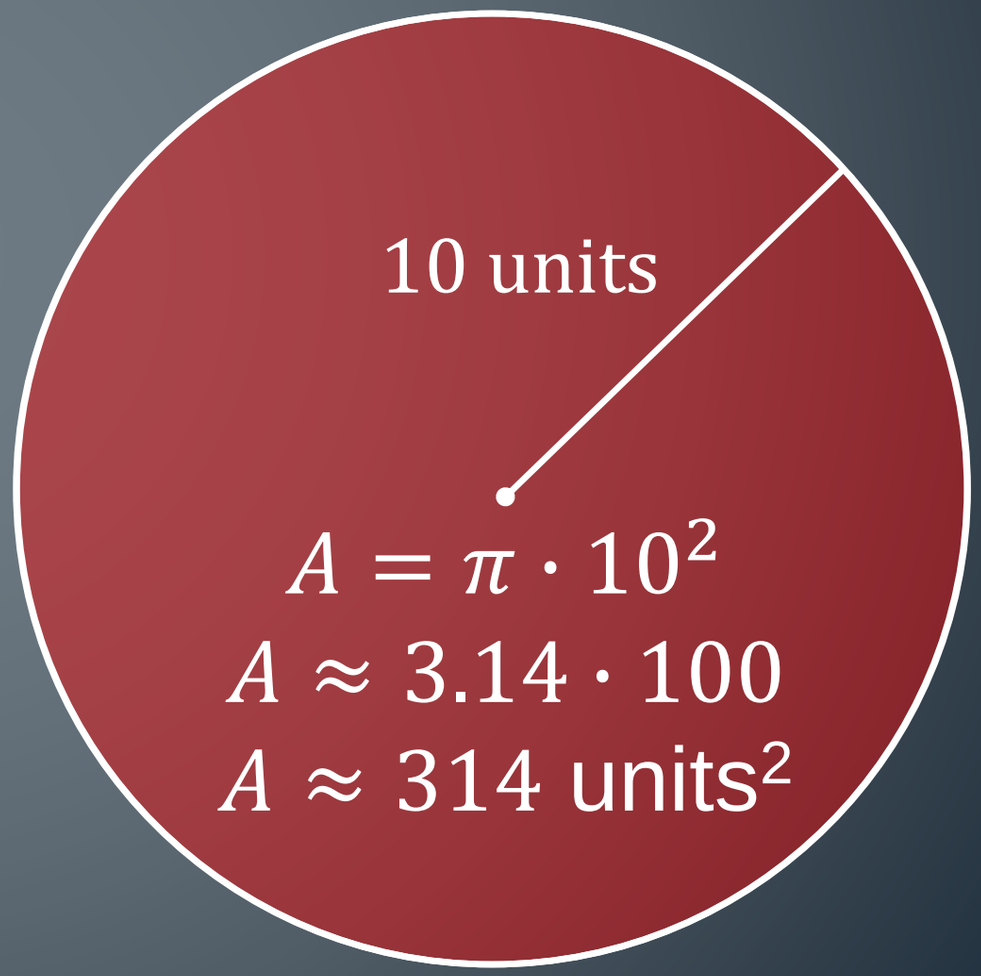
$C = \pi \cdot 20$

$C \approx 3.14 \cdot 20$

$C \approx 62.8$ units

$C = \pi d$ or $C = 2\pi r$

What is the circle's area? $\pi \approx 3.14$



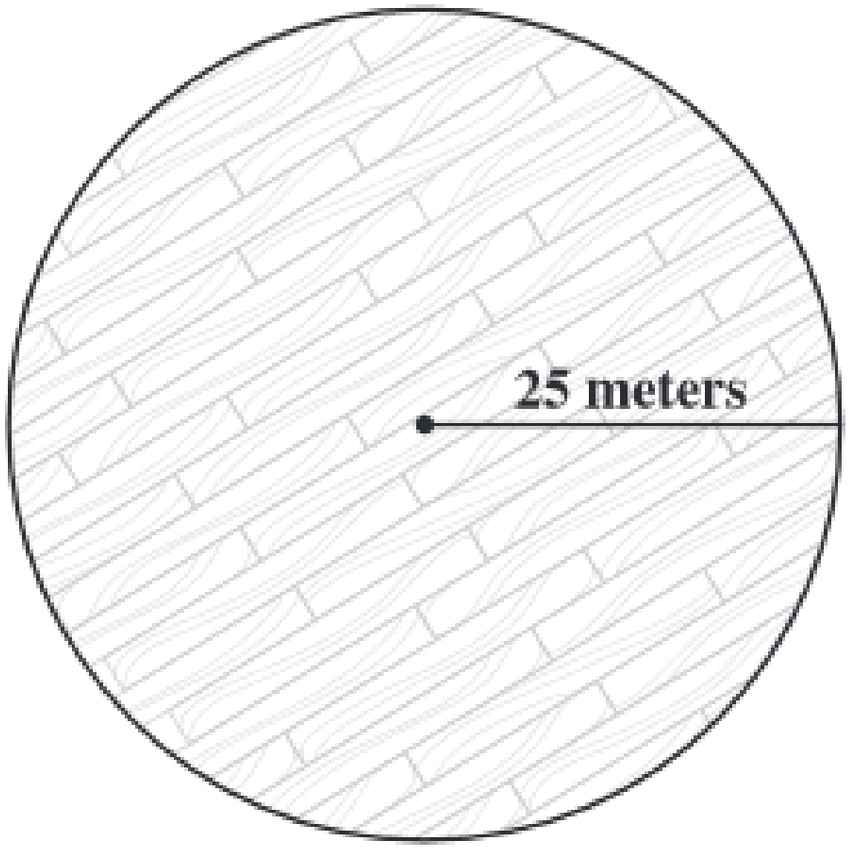
$A = \pi \cdot 10^2$

$A \approx 3.14 \cdot 100$

$A \approx 314$ units^2

$A = \pi r^2$

70 **This circular stage has a radius of 25 meters.**



Which equation could be used to find the area of the stage in square meters?

A $A = 25\pi$

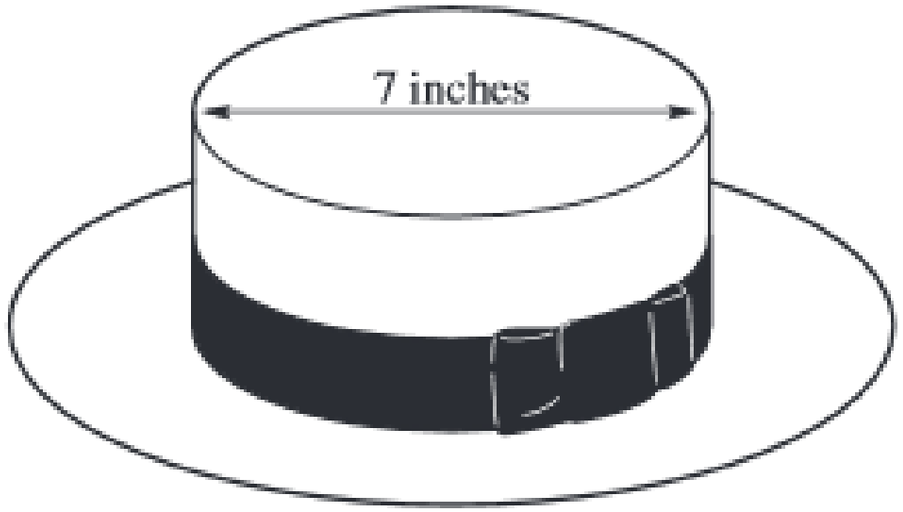
B $A = 50\pi$

C $A = \pi \bullet 25^2$

D $A = \pi \bullet 50^2$

CSM02059

72 **The top part of this hat is shaped like a cylinder with a diameter of 7 inches.**



Which measure is *closest* to the length of the band that goes around the outside of the hat?

A 10.1 inches

B 11.0 inches

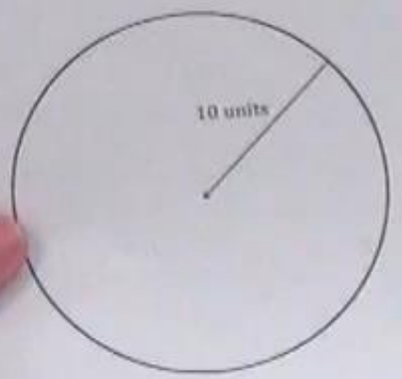
C 22.0 inches

D 38.5 inches

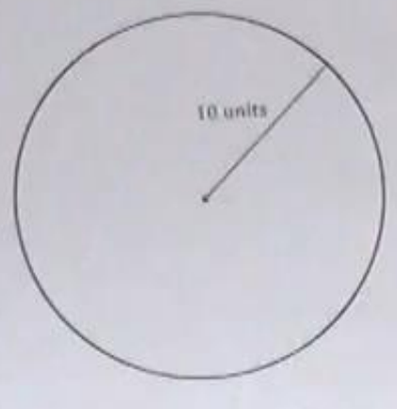
CSM00268

Source: 6th Grade CST Released Test Questions - http://www.cde.ca.gov/ta/tg/sr/documents/cstrtqmath6.pdf

What is the circle's circumference? $\pi \approx 3.14$



What is the circle's area? $\pi \approx 3.14$



Student Data Facts

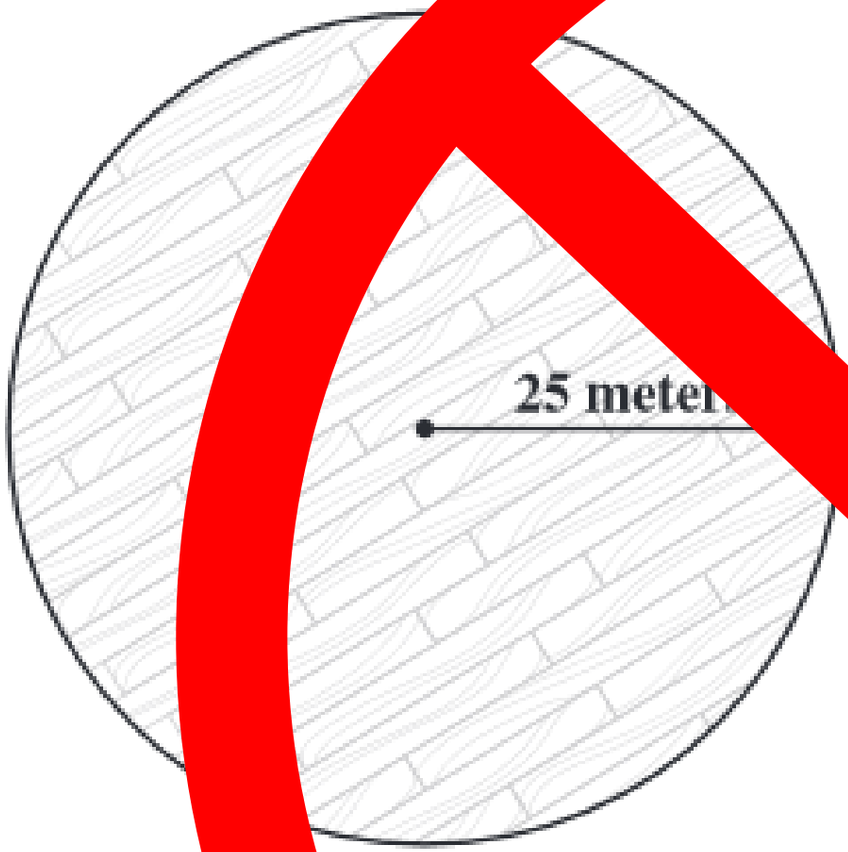
- 396 seventh grade students were assessed
- 68.26% correctly answered the circumference question
- 78.59% correctly answered the area question

Smarter Balanced Assessment Consortium

Mathematics Preliminary Summative Assessment Blueprint
Target Sampling Mathematics Grade 7—Table 6b

Claim	Content Category	Assessment Targets	DOK	Minimum # Scored Tasks		Minimum # Items per Item Type		Min/Max Number of Items
				CAT	PT/ECR	SR	CR	
		A. Analyze proportional relationships and use them to solve real-world and mathematical problems.	1,2	p(9)=1.0				
		E. Draw, construct, and describe geometrical figures and describe the relationship between them.	2,3					
		F. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.	1,2					
Supporting	Supporting Cluster	problems involving angle measure, area, surface area, and volume.	1,2	p(2)=1.0	0	2	1	5/8
		G. Use random sampling to draw inferences about a population.	1,2					
		H. Draw informal comparative inferences about two populations.	1,2					
		I. Investigate chance processes and develop, use, and evaluate probability models.	1,2					

70 This circular stage has a radi… meters.



Which equat… ould be used to find the area of the stage in … re meters?

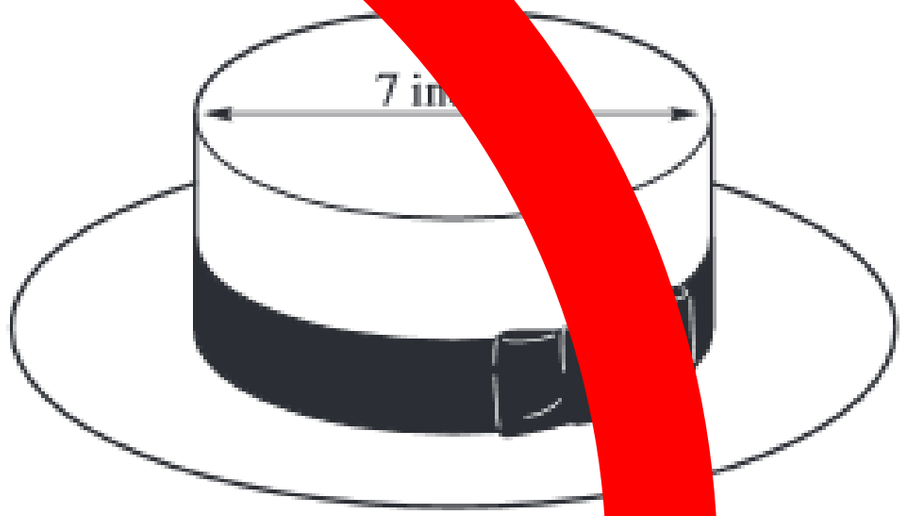
A $A = 25\pi$

B $A = 50\pi$

C $A = \pi \cdot 25^2$

D $A = \pi \cdot 50^2$

72 The … of this hat is shaped like a cylinder with a dia… 7 inches.



Which measure is *closest* to … ength of the band that goes around the c… le of the hat?

A …0.1 inches

B … inches

C 22… s

D 38.5 in…

CSM00268

Depth of Knowledge – Level Two

Which circle is bigger? How do you know?

Circle A

Area = 36 units^2

$$C = \pi \cdot 2 \cdot r$$

$$36 \approx 6.28 \cdot r$$

$$\frac{36}{6.28} \approx r$$

$$5.73\ units \approx r$$

Circle B

Circumference = 36 units

$$A = \pi \cdot r^2$$

$$A \approx 3.14 \cdot 5.73^2$$

$$A \approx 3.14 \cdot 32.83$$

$$A \approx 103.15\ units^2$$

SBAC Constructed Response Rubric

- 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.

Which circle is bigger? How do you know?

Circle A
Area = 36 units²

Circle B
Circumference = 36 units

Video Facts

- Of the ten students interviewed:
  - Ten correctly answered both of the DOK 1 questions.
  - One earned two points on the DOK 2 question.
  - Six earned one point on the DOK 2 question.
  - Three earned zero points on the DOK 2 question.

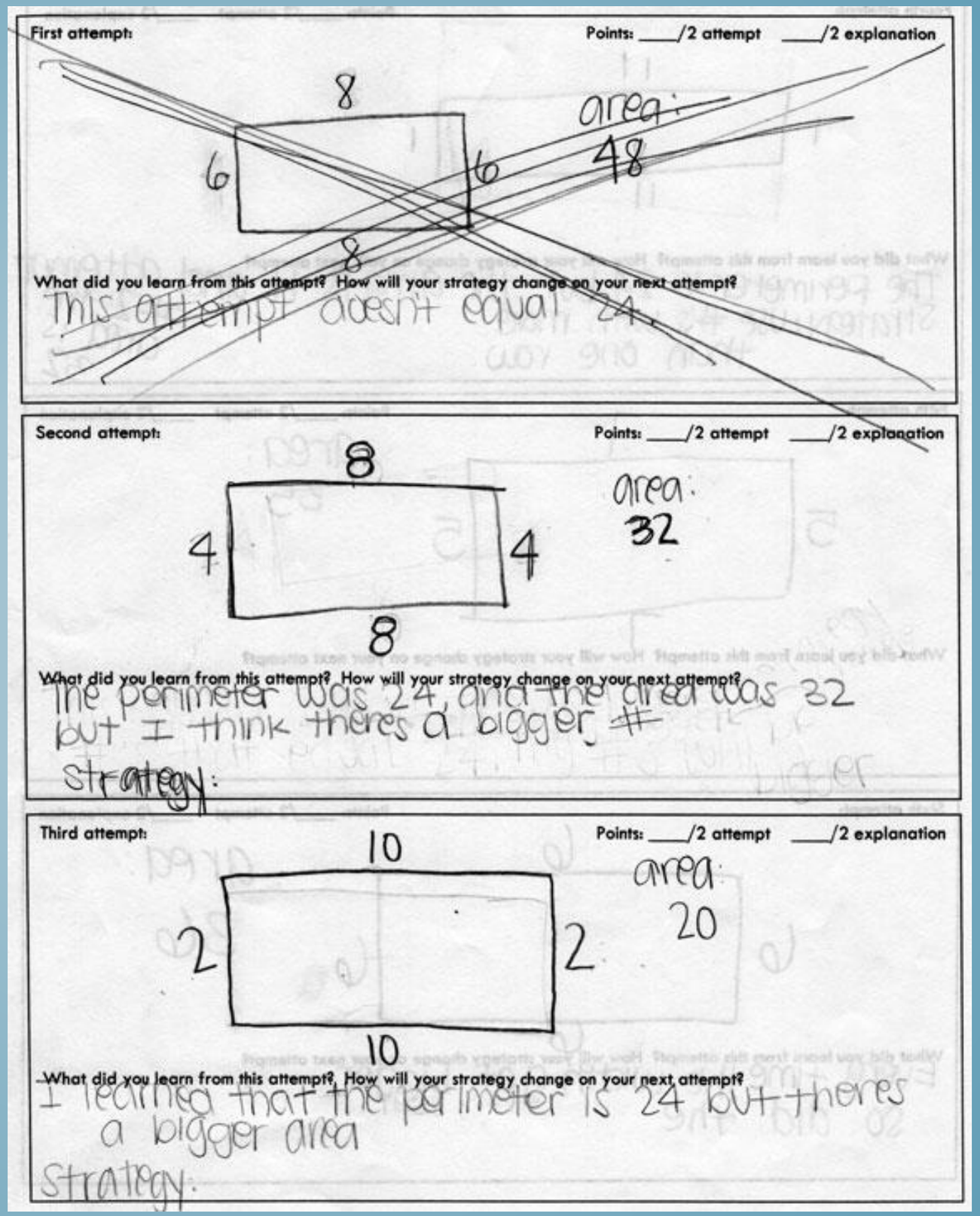
Student Data Facts

- Of the 396 seventh grade students who were assessed, 12.12% earned two points on the DOK 2 question.
- 97.92% of the students who correctly answered the DOK 2 question also correctly answered both of the two DOK 1 questions.
- 10.61% of the students who correctly answered both of the two DOK 1 questions also correctly answered the DOK 2 question.

More Student Data Facts

- 28.28% of the students earned only one point.
- All of them earned one point by choosing Circle B and providing insufficient reasoning.
- 59.59% of the students earned no points.

STUDENT WORK



Open Middle Problems

- Open middle problems require a higher depth of knowledge than most problems that assess procedural and conceptual understanding.
- They often have a “closed beginning” meaning that they all start with the same initial problem
- They often have a “closed end” meaning that they all end with the same answer
- They have an “open middle” meaning that there are multiple ways to approach and ultimately solve the problem

www.openmiddle.com

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Why Choose Us?

1 Math content expert

Robert graduated from University of California, Los Angeles (UCLA) with a Bachelors of Science in Mathematics. He has taught mathematics to students at the elementary, middle, and high school levels. As

Lessons

How Much Is One Third Of A Cup Of Butter?

How Do Skytypers Write Messages?

Robert Kaplinsky's Problem-Based Lessons

File Edit View Insert Format Data Tools Help All changes saved in Drive

	A	B	C	D	E	F	
1	Task Name	Concept / Skill	Standard 1	Standard 2	Standard 3	Standard 4	Sta
2	How Can We Water All Of The Grass?	Circles, Pythagorean Theorem, trigonometric ratios	7.G.4	8.G.7	G-SRT.8	G-MG.1	G-M
3	How Much Money IS That?!	Volume of rectangular prism	5.MD.3	5.MD.4	5.MD.5	5.MD.5b	5.M
4	How Much Money Should Dr. Evil Demand?	Exponential Growth	N-RN.2	A-SSE.1	A-SSE.3c	A-SSE.4	A-R
5	How Tall Is Mini-Me?	Scale and Dividing Decimals	5.NF.5	5.NF.5a	5.NF.5b	6.NS.3	
6	How Did They Make Ms. Pac-Man?	Transformations (Rotations, Reflections, and Translations)	8.G.1	8.G.2	8.G.3	8.G.4	G-S
7	Which Ticket Option Is The Best Deal?	Unit Rates and Ratios	6.RP.2	6.RP.3	6.RP.3a	6.RP.3b	
8	How Far Apart Are The Freeway Exits?	Fractions on a Number Line and Subtracting Fractions	3.NF.2	3.NF.2b	4.NF.2	4.NF.3a	4.N
9	Do We Have Enough Paint?	Area	3.MD.5	3.MD.6	3.MD.7		
10	How Many Stars Are There In The Universe?	Scientific Notation	8.EE.3	8.EE.4			
11	What Rides Can You Go On?	Inequalities and Measurement	2.MD.1	6.NS.7a	6.NS.7b		
12	Do You Have Enough Money?	Money	2.MD.8				
13	Which Bed Bath & Beyond Coupon Should You Use?	Percent Discount	7.RP.3				
14	Is Gas Cheaper With Cash Or Credit Card?	Percent Discount	7.RP.3				
15	Where's The Nearest Toys R Us?	Pythagorean Theorem (Distance in coordinate system)	8.G.8	G-SRT.8	G-GPE.7		
16	How Sharp Is The iPhone 5's Retina Display?	Pythagorean Theorem (Length of a side)	8.G.7	G-SRT.8	G-GPE.7		
17	When Should She Take Her Medicine?	Operations with Time Intervals	4.MD.2				
18	How Big Are Sunspots?	Converting Units, Proportions, and Scientific Notation	5.MD.1	7.RP.2	7.G.4	8.EE.4	G-M
19	What Michael's Coupon Should I Use?	Percent Discount	7.RP.3	A-CED.3			
20	Is It Cheaper To Pay Monthly or Annually?	Decimal Operations and/or Systems of Equations	5.NBT.7	8.EE.8c	A-CED.3	A-REI.11	F-B
21	How Big Is The 2010 Guatemalan Sinkhole?	Volume of Cylinder	5.MD.3	5.MD.4	5.MD.5	8.G.9	G-C
22	How Can You Win Every Prize At Chuck E. Cheese's?	Decomposing Numbers and/or Systems of Equations	2.NBT.7	3.NBT.2	3.NBT.3	8.EE.8c	A-C
23	How Many Royal Flushes Will You Get?	Probability	7.SP.5	7.SP.6	7.SP.7	S-MD.5	S-M
24	How Much Does The Paint On A Space Shuttle Weigh?	Surface Area	6.G.4	7.G.6	8.G.7	G-MG.1	G-M
25	How Did Motel 6 Go From $6 to $66?	Percent Increase and Compound Interest	7.RP.3	A-SSE.1b	F-BF.1	F-IF.8b	F-L
26	How Much Does The Aluminum Foil Prank Cost?	Surface Area and Unit Rates	6.G.4	6.RP.2	6.RP.3	7.G.6	
27	How Many Laps Is A 5k Race?	Perimeter	4.MD.3				
28	Which Toilet Uses Less Water?	Systems of Equations/Inequalities	8.EE.8c	A-CED.3	A-REI.11	F-BF.1	
29	How Did Someone Get A $103,000 Speeding Ticket In Finland?	Linear Equations	A-CED.2	F-BF.1	F-IF.4	F-IF.6	
30	Which Pizza Is A Better Deal?	Area or Circle, Square, and Unit Rates	3.MD.5	3.MD.6	3.MD.7	4.MD.3	6.R
31	How Big Is The World's Largest Deliverable Pizza?	Area of Square	3.MD.5	3.MD.6	3.MD.7	4.NBT.3	4.M
32	How Many Sheets Do You Need To Break Out Of Prison?	Integer Operations	5.NBT.6				
33	Do Hybrid Cars Pay For Themselves?	Systems of Equations or Rates	6.RP.2	6.RP.3	8.EE.8c	A-CED.3	F-B
34	How Many Hot Dogs Did They Eat?!	Linear and Quadratic Functions	8.F.3	8.F.4	F-BF.1	F-BF.2	F-I
35	How Much Purple Ribbon Will You Need?	Perimeter & Circumference	3.MD.8	4.MD.3	7.G.4		
36	Are We There Yet?	Adding Times	3.MD.1	4.MD.2			
37	Which Chinese Food Coupon Should I Use?	Percent Discount	7.RP.3				
38	How Big Is The Vehicle That Uses Those Tires?	Ratio and Proportions	7.RP.2				
39	Where Would The Angry Birds Have Landed?	Create Equation From Quadratic Graph	A-CED.1	F-BF.1	F-IF.4	F-IF.7a	F-L
40	How Many Movies Can You See In One Day?	Adding Times	3.MD.1	4.MD.2			
41	Which Carrots Should You Buy?	Unit Rates	6.RP.1	6.RP.2	6.RP.3		
42	How Fast Can You Throw A Baseball?	Converting Units and Unit Rates	5.MD.1	6.RP.2			

Problem-Based Lesson Search Engine

This search engine searches all of the sites below to quickly help you find a problem-based lesson (also called 3-Act Task, mathematical modeling, or application problem):

Submit

The links below are the pages that are being searched by the search engine:

- 101 Questions
- Andrew Stadel
- Dan Meyer
- Dane Ehlert
- Emergent Math's Problem Based Curriculum Maps
- Estimation180
- Geoff Krall

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