

*Findings and Trends*  
*from the*  
***Silicon Valley***  
***Mathematics***  
***Initiative***

General MAC Meeting

May 11, 2005

# The Seventh Annual MAC/MARS Exam 2005

- We estimate that we assessed and scored nearly 70,000 students' performance exams.
- MAC provided high quality mathematics performance exams in nine grades/course (2nd - Course 2)
- A total of 33 school districts from three Bay Area counties participated this year.

# Congratulation to our New Districts

- Aspire Public Schools
- Emery Unified School District
- Oakland Unified School District
- Ravenswood School District
- San Mateo Court and Community Schools

# Thanks to our MAC Trainers

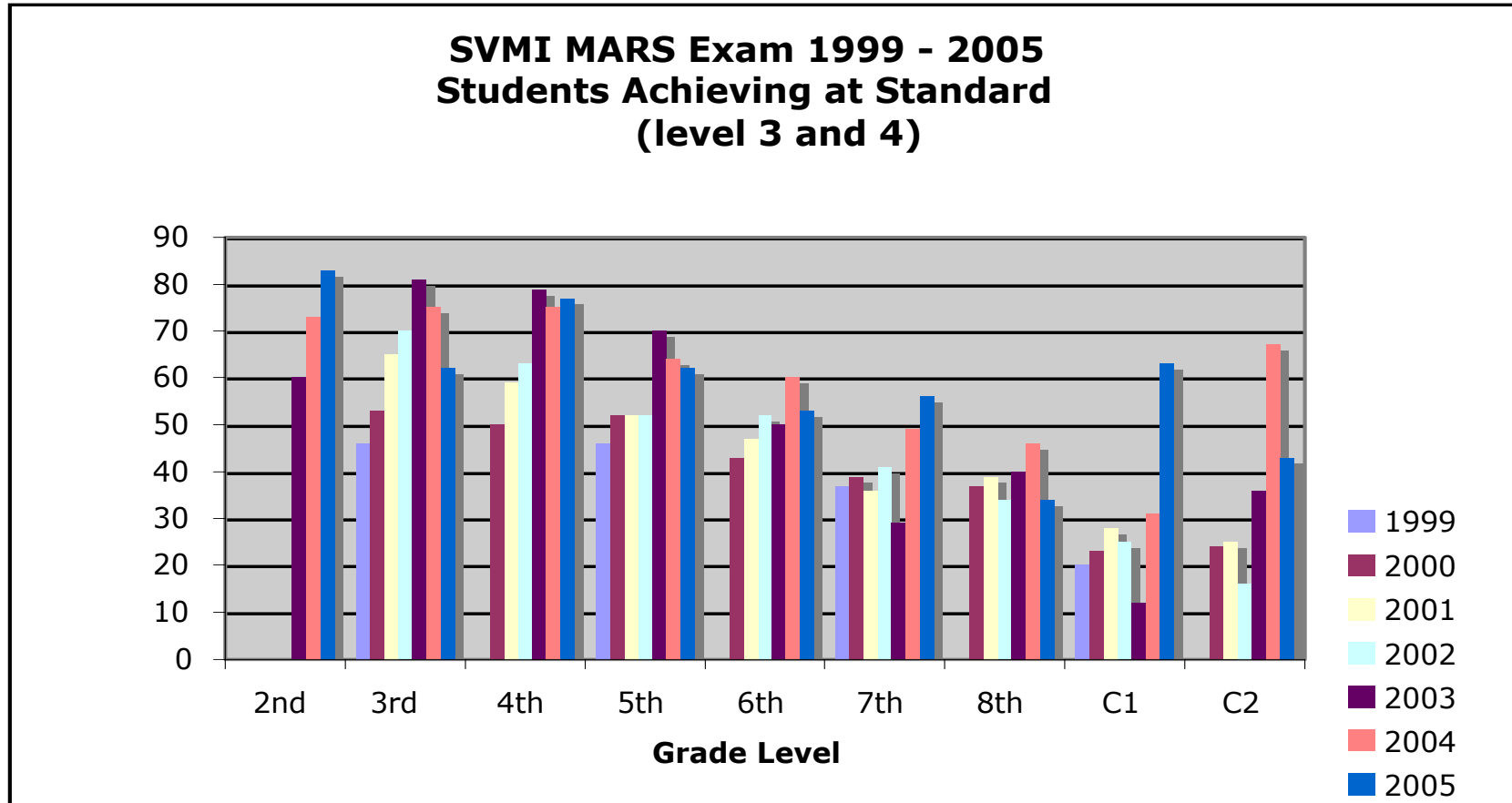
- Ford Long, Pacifica
- Jennifer Abaya, Brisbane
- Jean Short, Campbell
- Sandi Yellenberg, Los Gatos
- Sandy Devlin, Morgan Hill
- Jeff Trubey , Fremont
- Sally Keyes, Mtn. View Whisman
- Margie Trainer, San Carlos
- Anne Paterson, Santa Clara
- Jake Disston, Berkeley
- Cathy Humphreys, Mtn. View Whisman

# Special Thank You

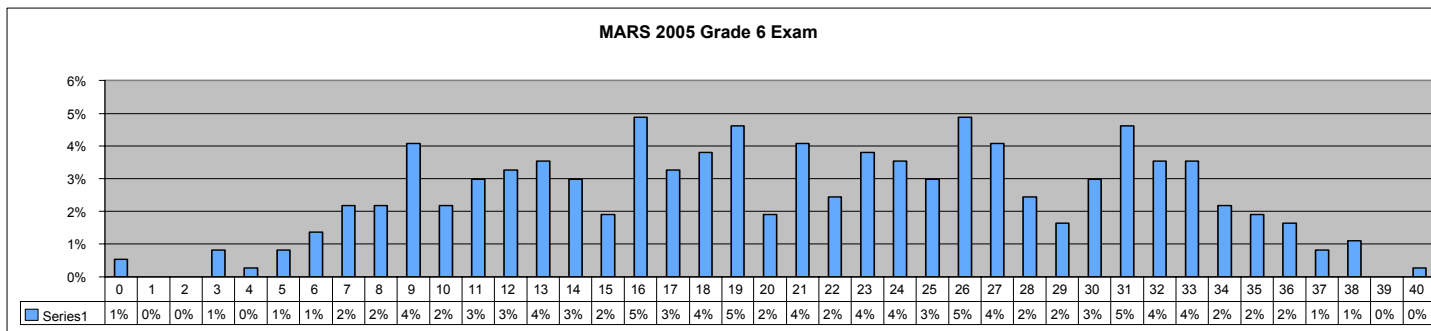
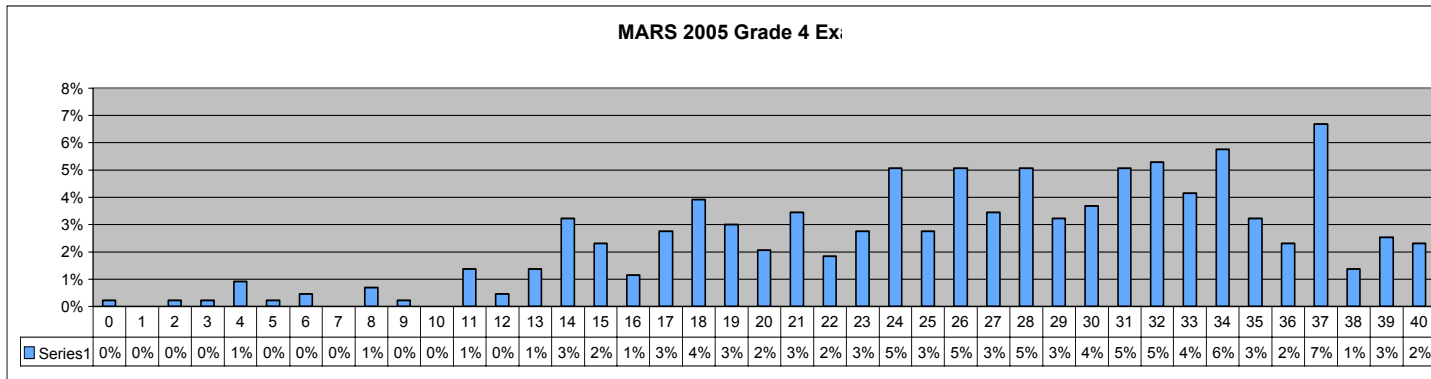
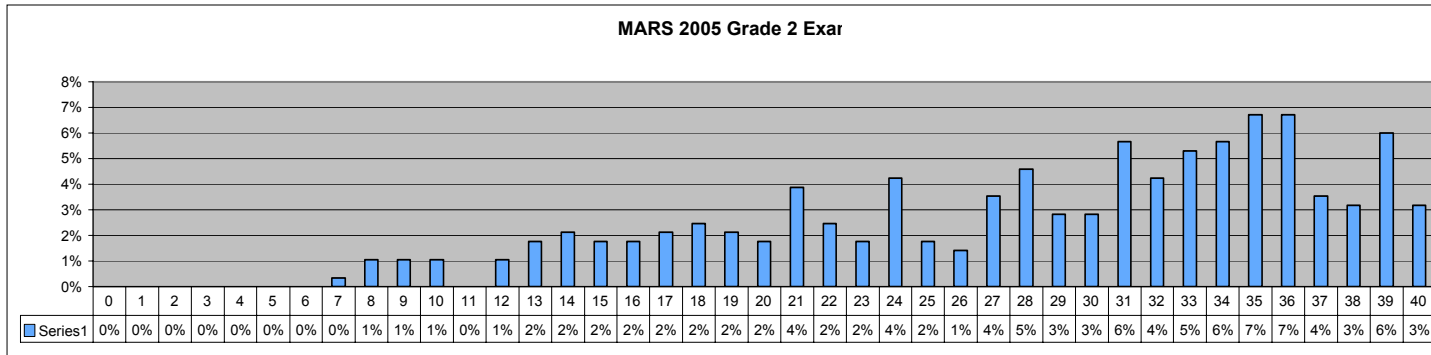
- Melissa Adams, Author and Trainer for the MAC Second Grade Exam and Tool Kit.
- Linda Fisher, MAC Director (Lead Trainer, Author of the ISR, Tools for Teacher and Final Reports).
- Dr. Joanne Rossi Becker, Director of SCVMP the fiscal and academic home of MAC.

# History of MARS

## Performance '99 - '05

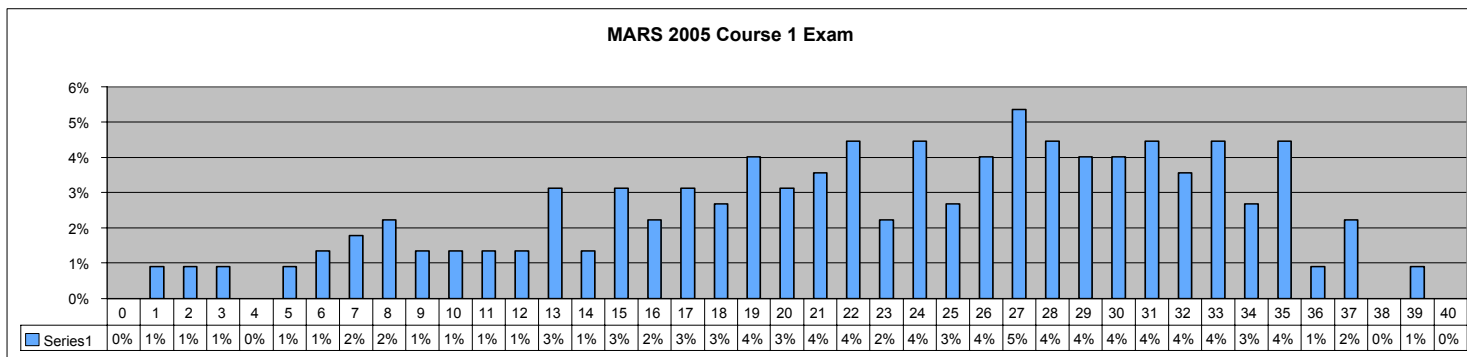
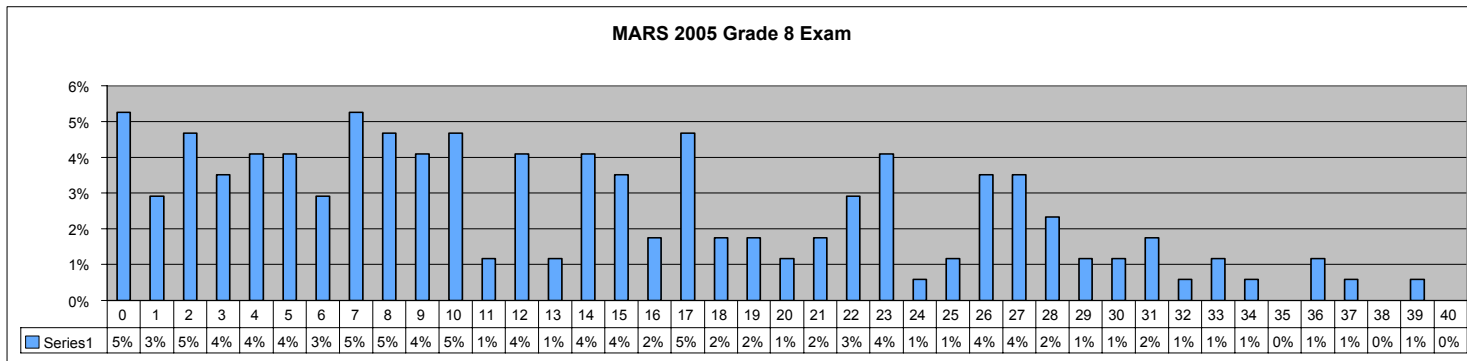
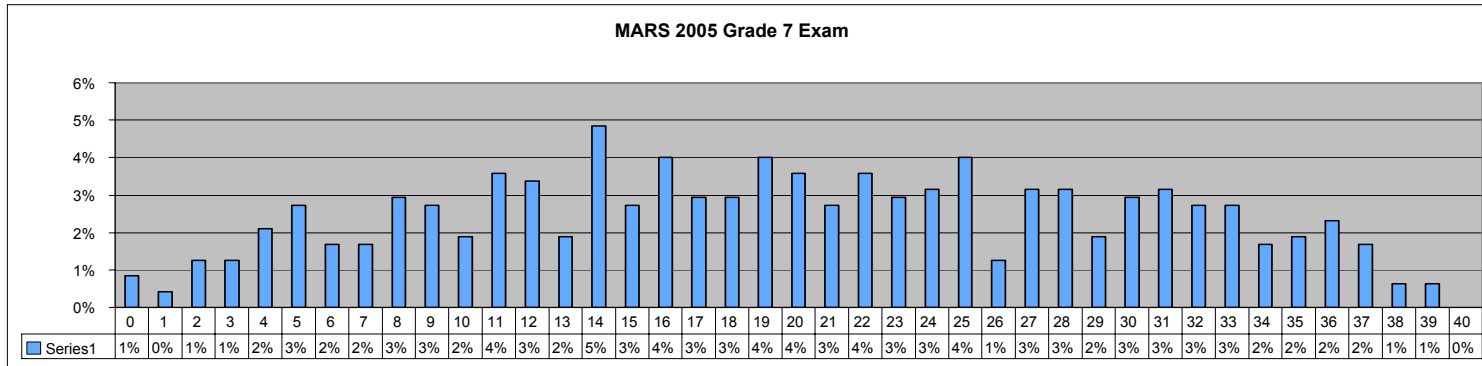


# Performance Trends 2, 4, 6



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# Middle School and Tracking



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# Troubling Trends

# Task on Fractions 5th Grade

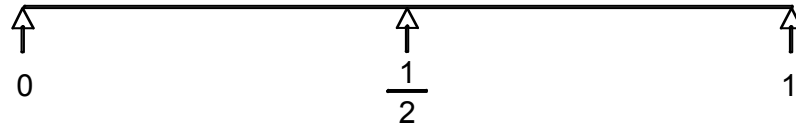
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## Fractions

This problem gives you the chance to:

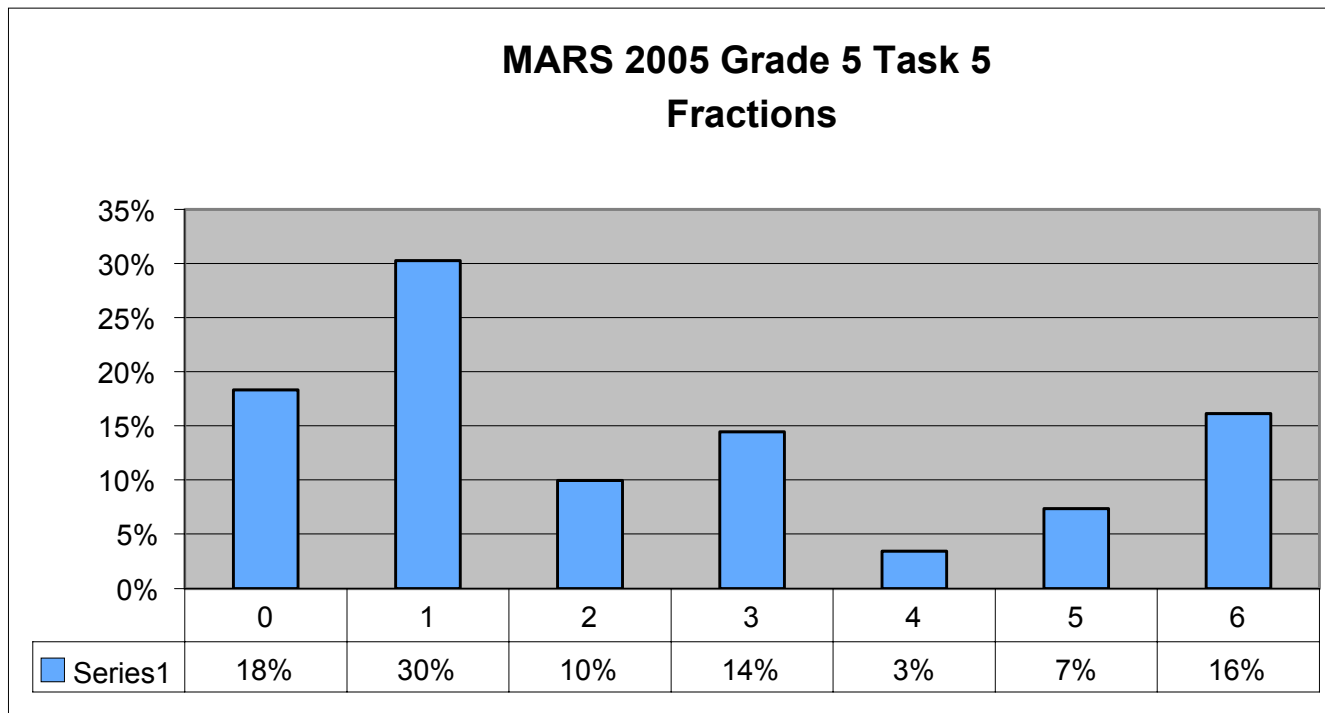
- show the position of fractions on a number line
  - compare the sizes of fractions
- 

Here is a number line.



1. Mark the position of the two fractions  $\frac{2}{3}$  and  $\frac{2}{5}$  on the number line.
2. Explain how you decided where to place  $\frac{2}{3}$  and  $\frac{2}{5}$  on the number line.

Approximately 50% of the Students could not accurately locate the fractions on the number line



# Task on Fractions 6th Grade

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## How Much Money?

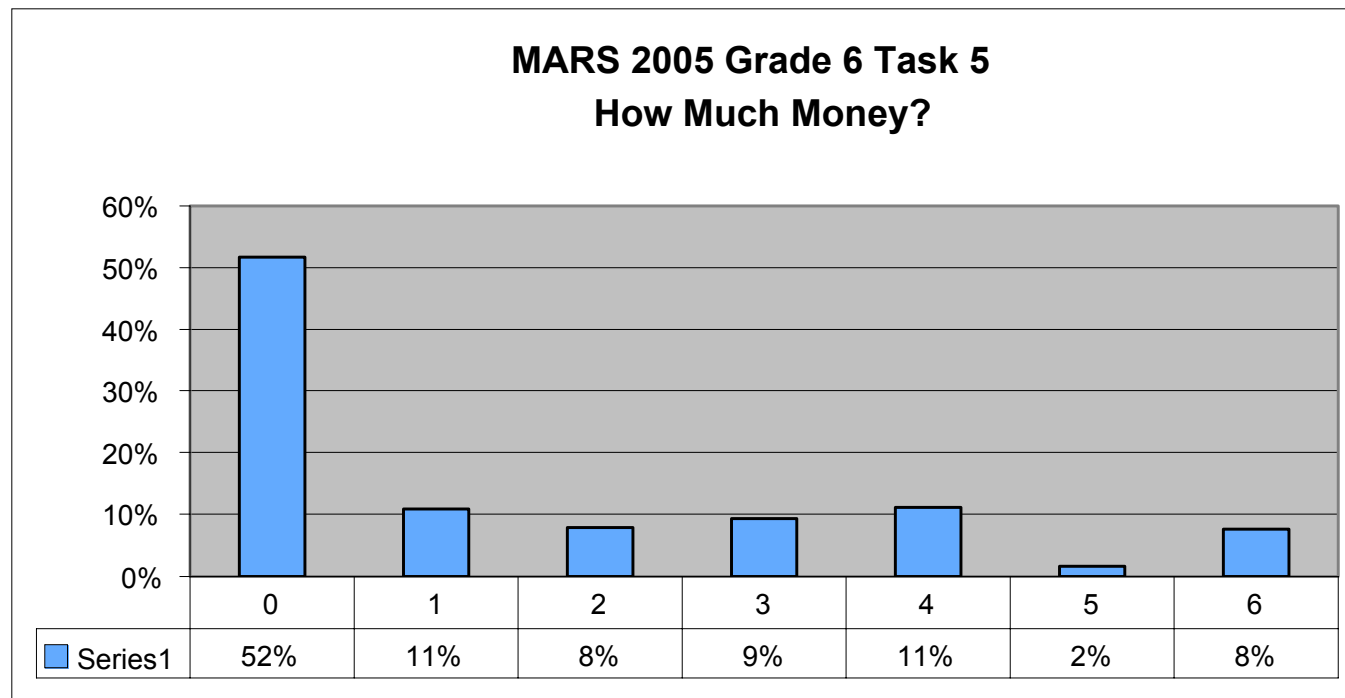
This problem gives you the chance to:

- work with simple fractions
  - figure out a money problem
- 

Chuck has \$6 and he spends  $\frac{1}{5}$  of his money on candy.

1. How much money does Chuck have left?

Over 50% of the students were unable to compute a straight forward problem involving fractions.



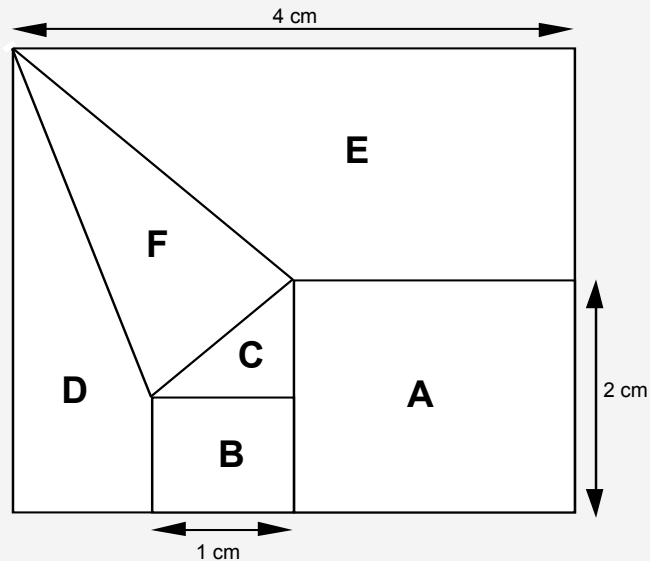
# Task on Fractions at 8th Grade

## Fractions of a Square

This problem gives you the chance to:

- calculate areas and fractional regions of a square

The large square shown below is cut into pieces along the lines shown in the diagram.



(diagram not drawn to scale)

The large square is 4 cm long and 4 cm wide.

Square A is 2 cm long and 2 cm wide.

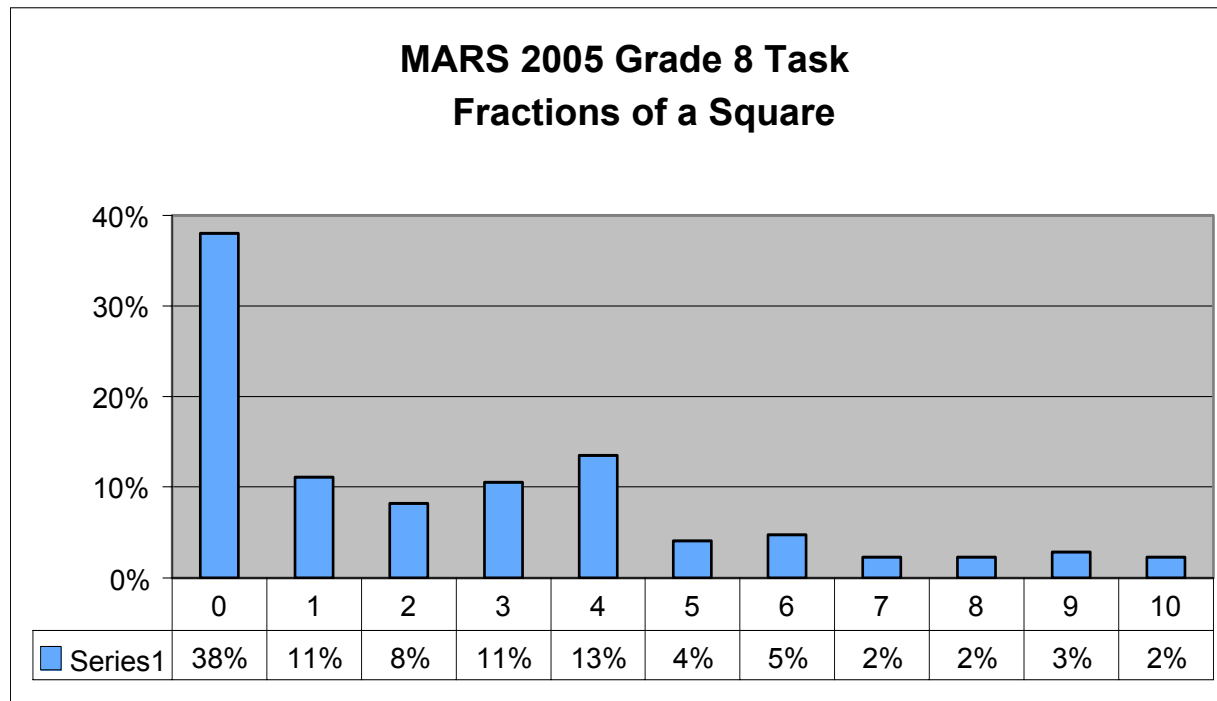
Square B is 1 cm long and 1 cm wide.

What **fraction** of the large square are the other pieces?

Show your work.

**Piece A** \_\_\_\_\_

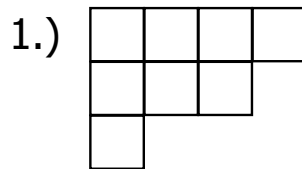
40% of the students were unable to identify a single fraction.



# Task on Fractions 2nd Grade

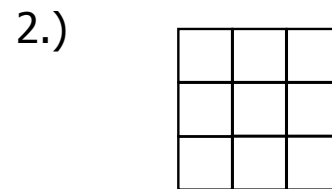
## Half and Half

Look at the three shapes below and on the next page. Find out if you can color in one half of the shape. Circle "yes" or "no" below the shape. Then, write an addition sentence that describes how you colored in the shape.



Yes          No

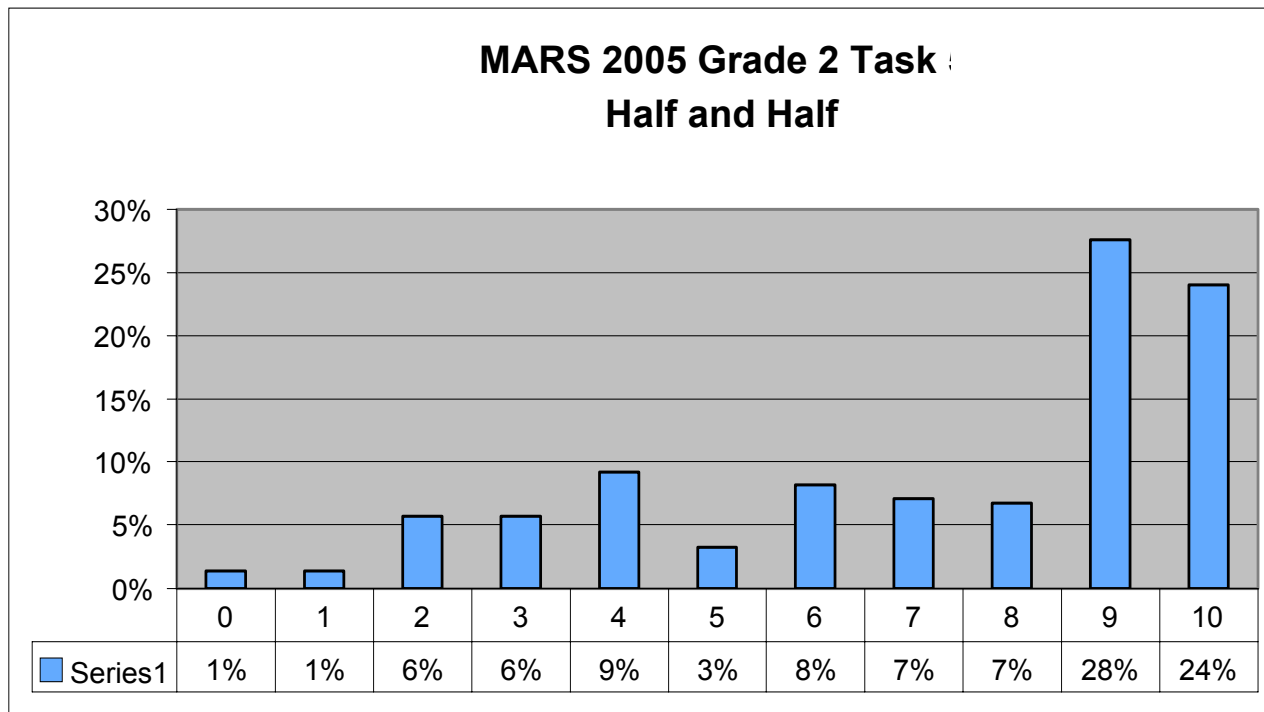
$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$



Yes          No

$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

# Distribution of Scores on 2nd Grade Exam



**77% of Second Graders Met Core Standards on this Task**

# Observation from the Data

- Students 5-8 demonstrate little understanding or facility with fractions.
- The topic of fractions is complex (context, number vs. components, representations, magnitude, new domain)
- Students come to school with basic understandings of fractions.
- By the end of elementary school students have shifted from approaching mathematics from sense making to a mechanical process.

# Mathematical Justification

# Course 2 Task

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## Sum of Two Squares

This problem gives you the chance to:

- find and use a pattern
  - make and use an algebraic transformation
- 

Lewis Carroll, the author of *Alice in Wonderland*, was also a mathematician. In his diary for 1890, he wrote the following statement:

**$2(x^2 + y^2)$  is always the sum of two squares**

where  $x$  and  $y$  are a pair of non-zero integers.

If  $x = 2$  and  $y = 3$

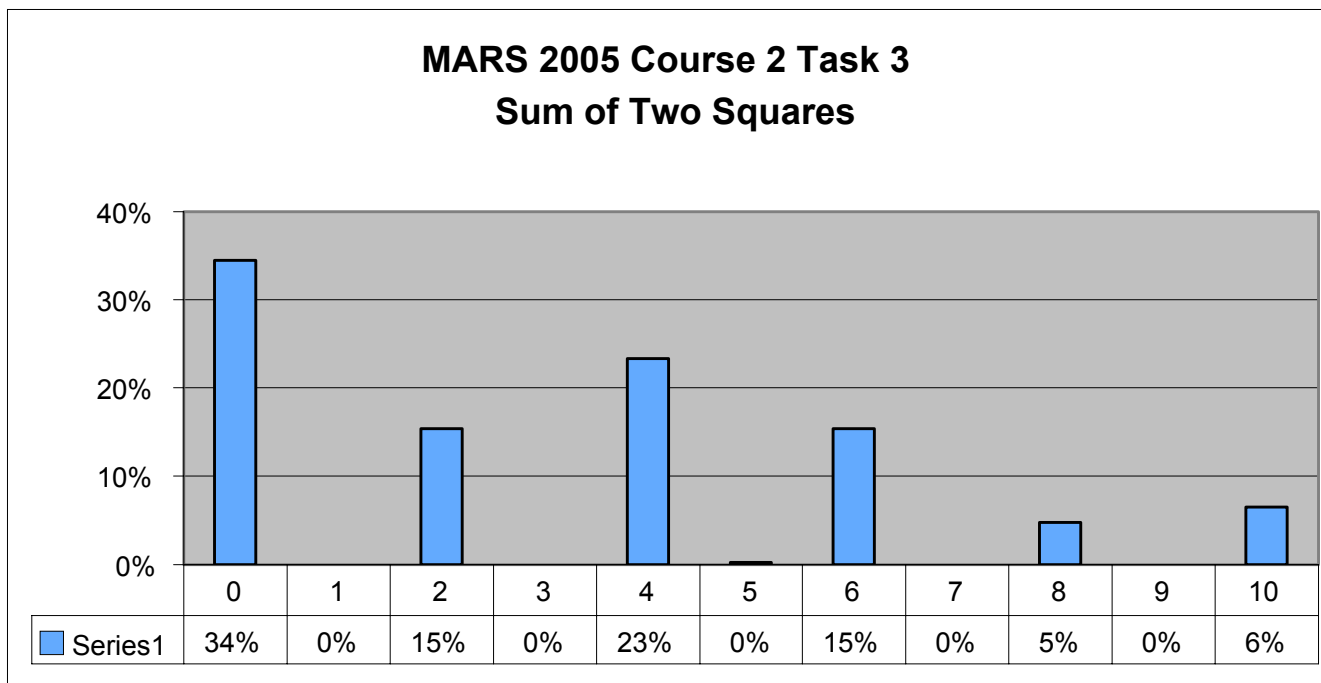
$$\begin{aligned}\text{then, } 2(x^2 + y^2) &= 2(4 + 9) \\ &= 2 \times 13 \\ &= 26 \\ &= 1^2 + 5^2\end{aligned}$$

which is the sum of two squares

3. Write  $2(x^2 + y^2)$  algebraically as the sum of two squares.
- 

4. Use algebra to prove that Lewis Carroll's statement is always true.

# Reasoning and Justification



Only 6% of students enrolled in Geometry are able to demonstrate the ability to justify and prove findings

# Course 1 - Math Reasoning

## Multiples of Three

This problem gives you the chance to:

- test statements to see if they are true
- find examples to match a description
- explain and justify your conclusions

**If a number is a multiple of three, its digits add up to a multiple of three.**

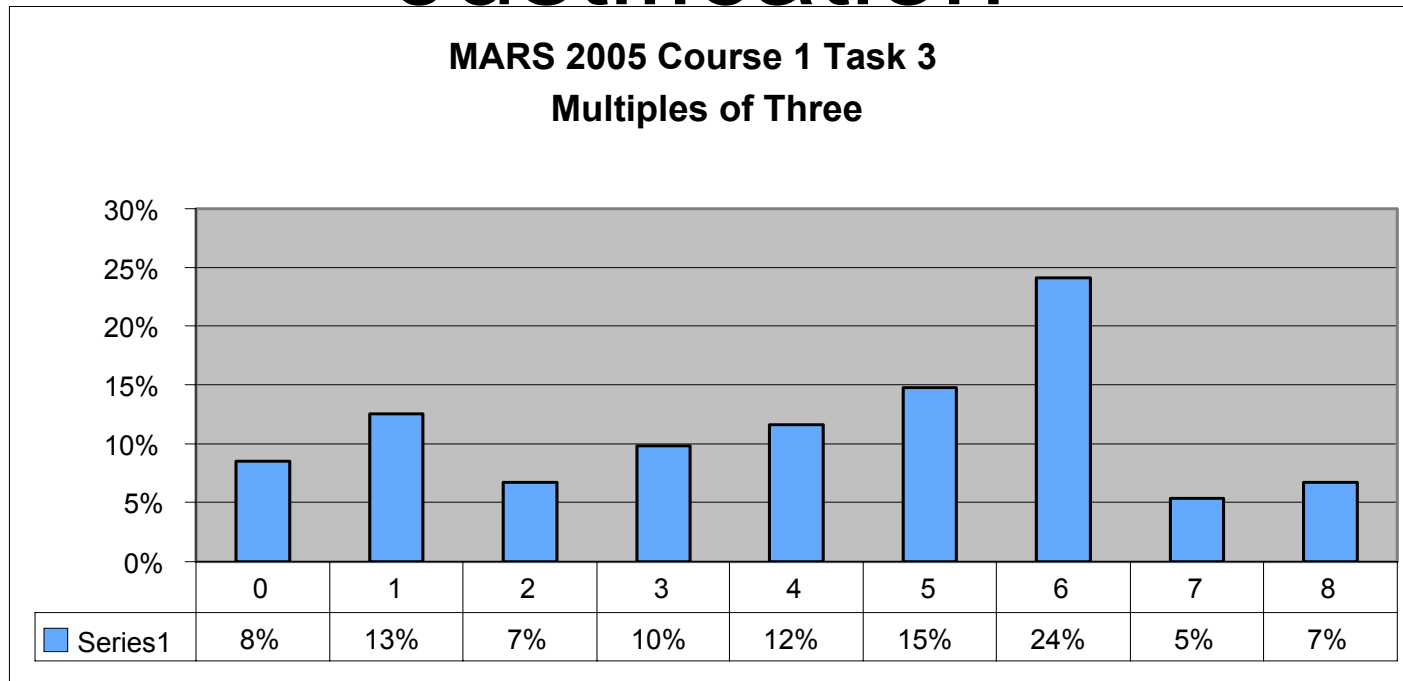
For example, 15 is a multiple of three ( $15 = 3 \times 5$ )  
and  $1 + 5 = 6$ , which is a multiple of three.

4. Phil says, “If you add two multiples of three you always get a multiple of six.”

Is Phil correct? \_\_\_\_\_

Explain how you decided.

# Algebra Students & Justification

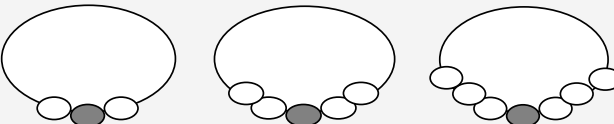


Only 7% of students in Algebra (accelerated 8th graders) could successfully complete a reasoning problem.

# 2nd Grade Task - Reasoning

**Growing Necklaces**

**Every year Matthew makes a necklace for his sister, Janci. Here are drawings of the necklaces.**



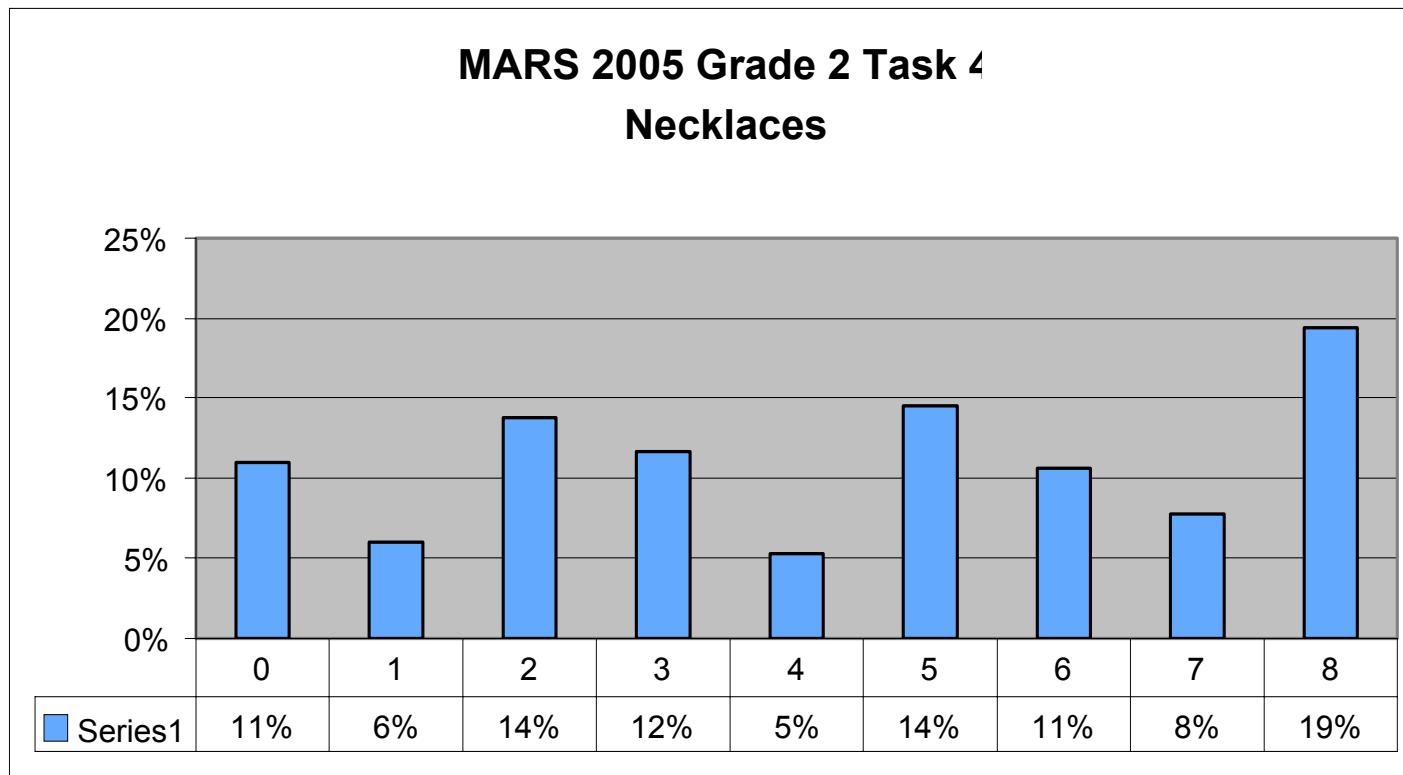
	Year 1	Year 2	Year 3	Year 4
<b>Beads</b>	<b>3 beads</b>	<b>5 beads</b>	<b>7 beads</b>	

**1. Would Matthew ever make a necklace like this for Janci with 12 beads?**

**Yes or No** \_\_\_\_\_

**Why or why not?**

# Primary Students Reason in Math



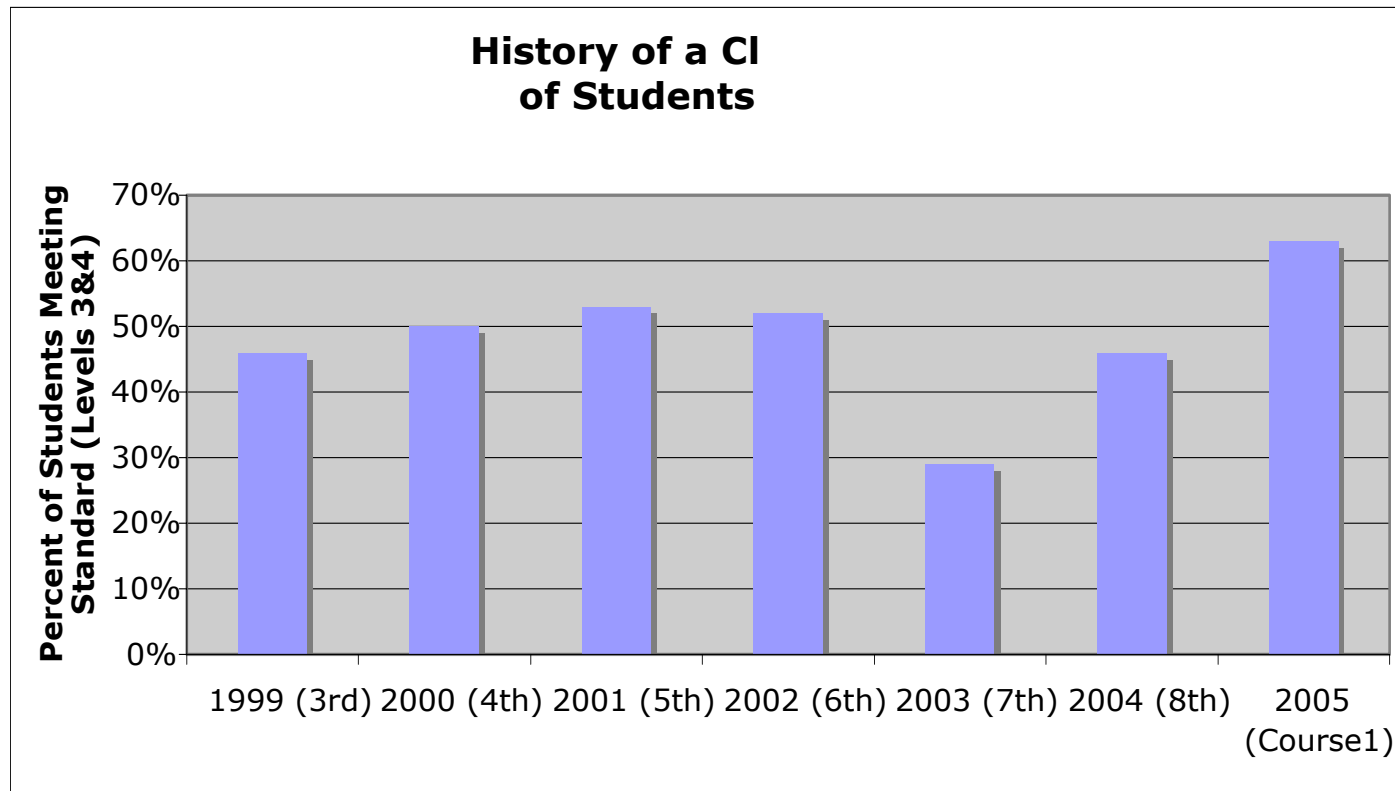
27% of second grade students could reason and explain why the pattern could never be equal to 12.

# What Do These Data Tell Us?

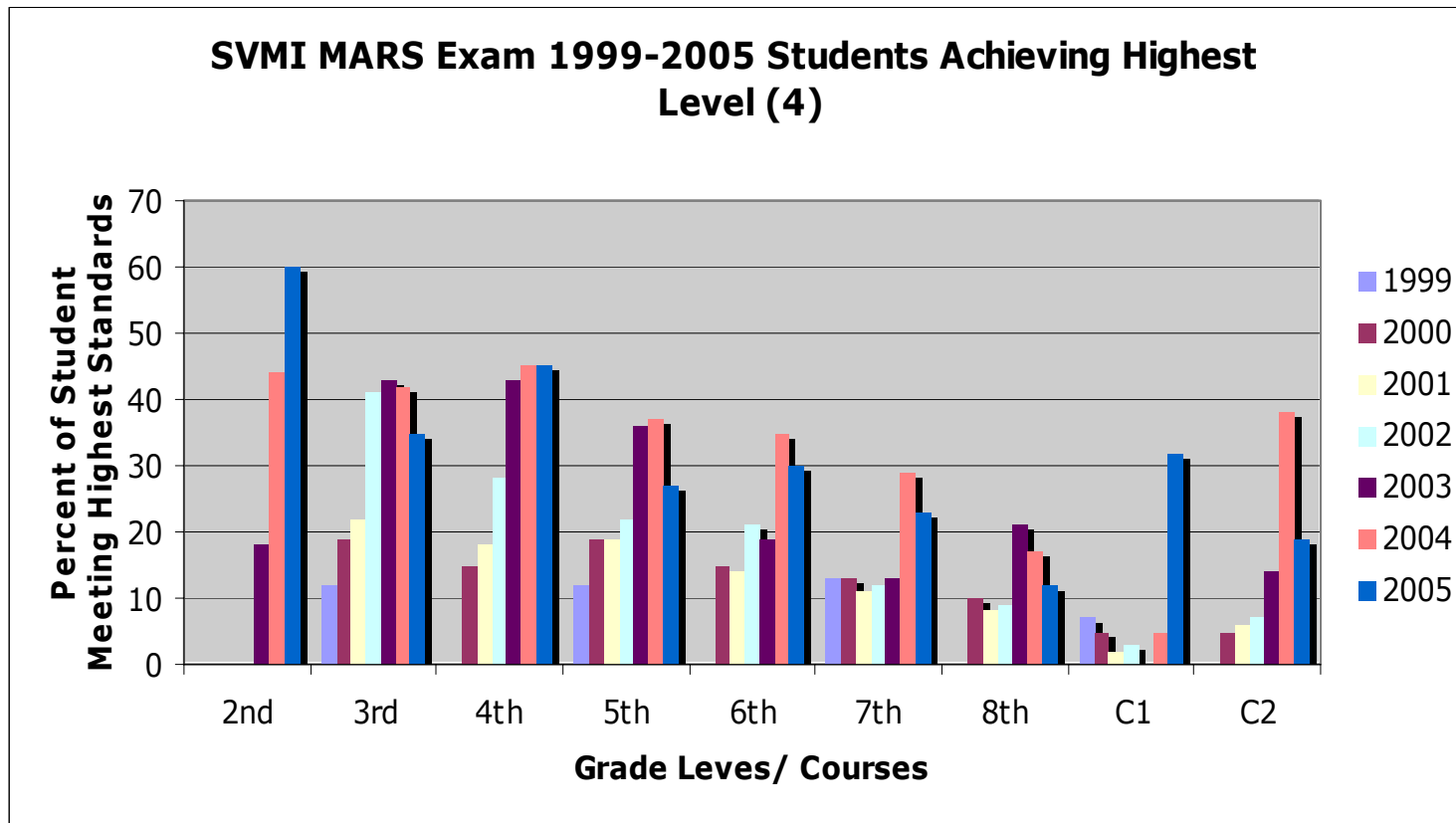
- Students are natural sense makers.
- Mathematics is the study of patterns and reasoning.
- High school and College mathematics is based on an axiomatic system of proof and justification.
- We must resist the self-serving, narrow view of covering topics for a test.
- Teachers must go deeper when teaching ideas, make sure the students are doing the thinking and reasoning in class, and actively teach justification and proof.

# The Good News

# Tracking “our” Average Student From 1999 - 2005



# Students Continue to Achieve at Highest Levels



# Final Thoughts

- More districts are using performance assessment to inform instruction.
- More teachers are engaging in scoring and analyzing data - some of the best professional development available.
- More teachers are using real formative data to improve instruction.
- Performance levels at the middle school are improving.
- More students are achieving at high levels.

# Congratulations and Thanks to our 2005 Member Districts

- Alum Rock, Aspire PS, Bayshore, Berkeley, Brisbane, Burlingame, Cambrian, Campbell, Cupertino, East Side HSD, Emery, Evergreen, Fremont, Gilroy, Hayward, Jefferson, Los Gatos, Moreland, Morgan Hill, MVWSD, New Haven, Oakland, Pacifica, Palo Alto, Portola Valley, Ravenswood, San Carlos, SMCOE, SMFC, Santa Clara, Saratoga, Union, Woodside