

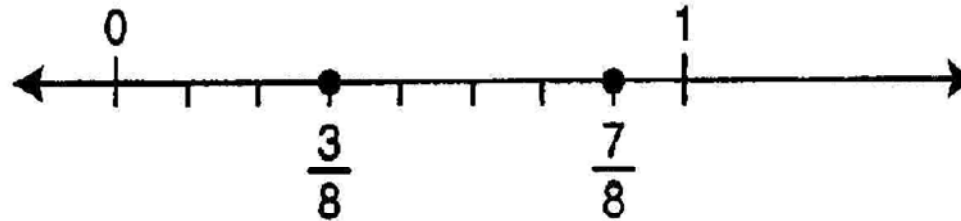
# ***The Meaning of World-Class Standards***

**November 17, 2005**

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Michigan State University***

# Elementary Students' Performance on a Fractions Problem

4. Which fraction is located between  $\frac{3}{8}$  and  $\frac{7}{8}$  on the number line?



- A.  $\frac{1}{4}$   
B.  $\frac{1}{2}$   
C.  $\frac{8}{8}$   
D.  $\frac{10}{8}$

	Grade 3	Grade 4	Grade 5
	19.1	39.8	50.8

# Elementary & Middle School Students' Performance on a Fractions Problem

20. What is the value of  $\frac{4}{5} - \frac{1}{3} - \frac{1}{15}$  ?

A.  $\frac{1}{5}$

B.  $\frac{2}{5}$

C.  $\frac{7}{15}$

D.  $\frac{3}{4}$

E.  $\frac{4}{5}$

	<b>Grade 3</b>	<b>Grade 4</b>	<b>Grade 5</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
	14.1	21.2	16.7	28.4	37.7	51.2

## Middle School Students' Performance on an Algebra Problem

16. If  $3(2x - 5) + 5 - (x + 5) = 2(3 - x)$  what does  $x$  equal?

A.  $\frac{6}{7}$

B. 1

C. 4

D. 3

**Grade 6**

**Grade 7**

**Grade 8**

**19.9**

**31.5**

**31.6**

## High School Students' Performance on a Functions Problem

28. The inverse of a function is a logarithmic function in the form  $y = \log_b x$ . Which equation represents the original function?

A.  $y = b^x$

B.  $y = bx$

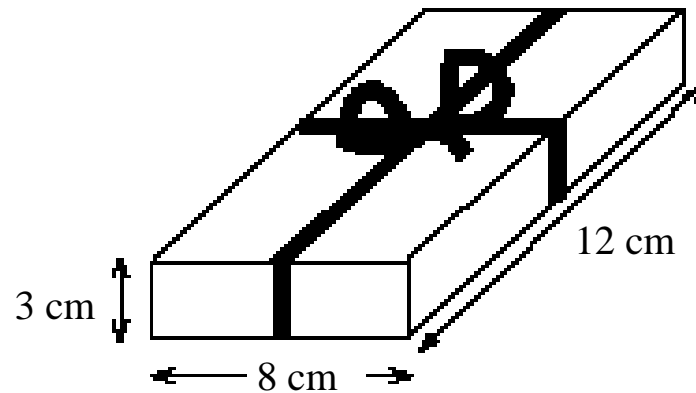
C.  $x = b^y$

D.  $by = x$

Grade 9	Grade 10	Grade 11	Grade 12
17.0	27.9	28.2	37.5

# High School Students' Performance on a Mathematics Literacy Problem

29. Stu wants to wrap some ribbon around a box as shown below and have 25 centimeters left to tie a bow.



How long a piece of ribbon does he need?

- A. 46 cm
- B. 77 cm
- C. 65 cm
- D. 71 cm

Grade 9	Grade 10	Grade 11	Grade 12
38.0	41.0	43.3	50.2

# Top Achieving Countries' Mathematics Curriculum

Topic	Grade							
	1	2	3	4	5	6	7	8
Whole Number: Meaning	■	■	■	●	●			
Whole Number: Operations	■	■	■	■	●			
Measurement Units	▲	■	■	■	■	■	●	
Common Fractions			▲	■	■	●		
Equations & Formulas			▲	●	●	●	■	■
Data Representation & Analysis			▲	▲	●	●		▲
2-D Geometry: Basics			▲	●	●	●	■	■
2-D Geometry: Polygons & Circles				▲	●	●	■	■
Measurement: Perimeter, Area & Volume				●	●	●	●	▲
Rounding & Significant Figures				●	●			
Estimating Computations				●	●	●		
Whole Numbers: Properties of Operations				●	●			
Estimating Quantity & Size				▲	▲			
Decimal Fractions				●	■	●		
Relation of Common & Decimal Fractions				▲	■	●		
Properties of Common & Decimal Fractions					●	●		
Percentages					●	●		
Proportionality Concepts					●	●	●	▲
Proportionality Problems					●	●	■	■
2-D Geometry: Coordinate Geometry					▲	▲	●	●
Geometry: Transformations						●	●	●
Negative Numbers, Integers, & Their Properties						▲	●	
Number Theory							●	▲
Exponents, Roots & Radicals							●	●
Exponents & Orders of Magnitude							▲	▲
Measurement: Estimation & Errors							▲	
Constructions Using Straightedge & Compass							■	▲
3-D Geometry							●	■
Geometry: Congruence & Similarity								■
Rational Numbers & Their Properties								▲
Patterns, Relations & Functions								▲
Proportionality: Slope & Trigonometry								▲

- ▲ Intended by 4 out of the 6 top-achieving countries
- Intended by all but *one* of the top-achieving countries (5 out of 6).
- Intended by *all* of the top-achieving countries.



## Minimal Standards?

- One course in each:  
**Mathematics, Biology, Chemistry, Physics**
- Algebra II/Biology/Chemistry/Physics
  - Less than 30 % of ALL Students
  - Less than 5 % of Voc/Tech Students
  - About 15 % of General Academic Students
  - About 40 % of College Preparatory Students

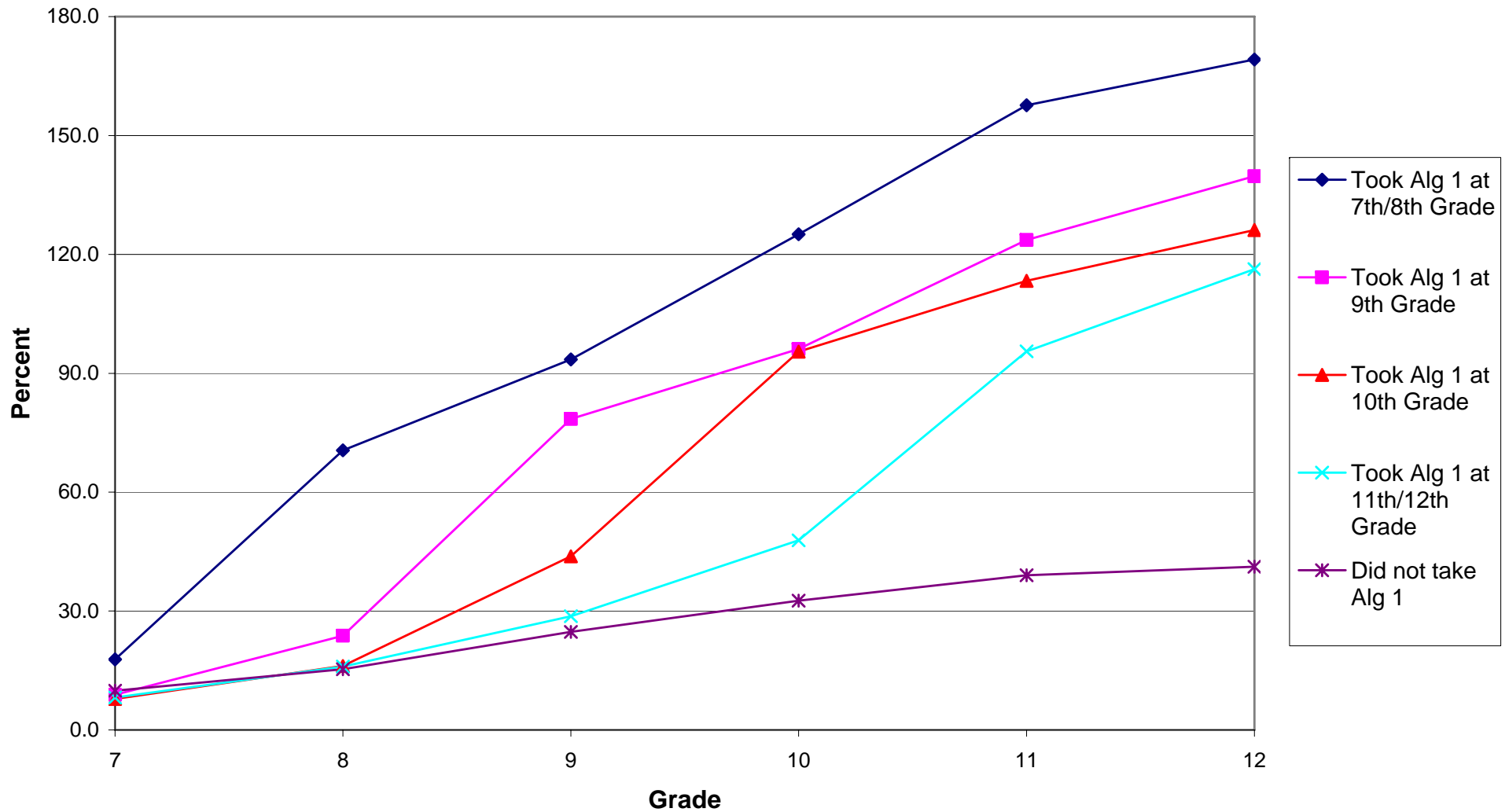
## Minimal Standards?

- One course in each:  
**Mathematics, Biology, Chemistry, Physics**
- Algebra II/Biology/Chemistry/Physics
  - Less than 20 % of ALL Black Students
  - Less than 5 % of Black Voc/Tech Students
  - About 11 % of Black General Academic Students
  - About 32 % of Black College Preparatory Students

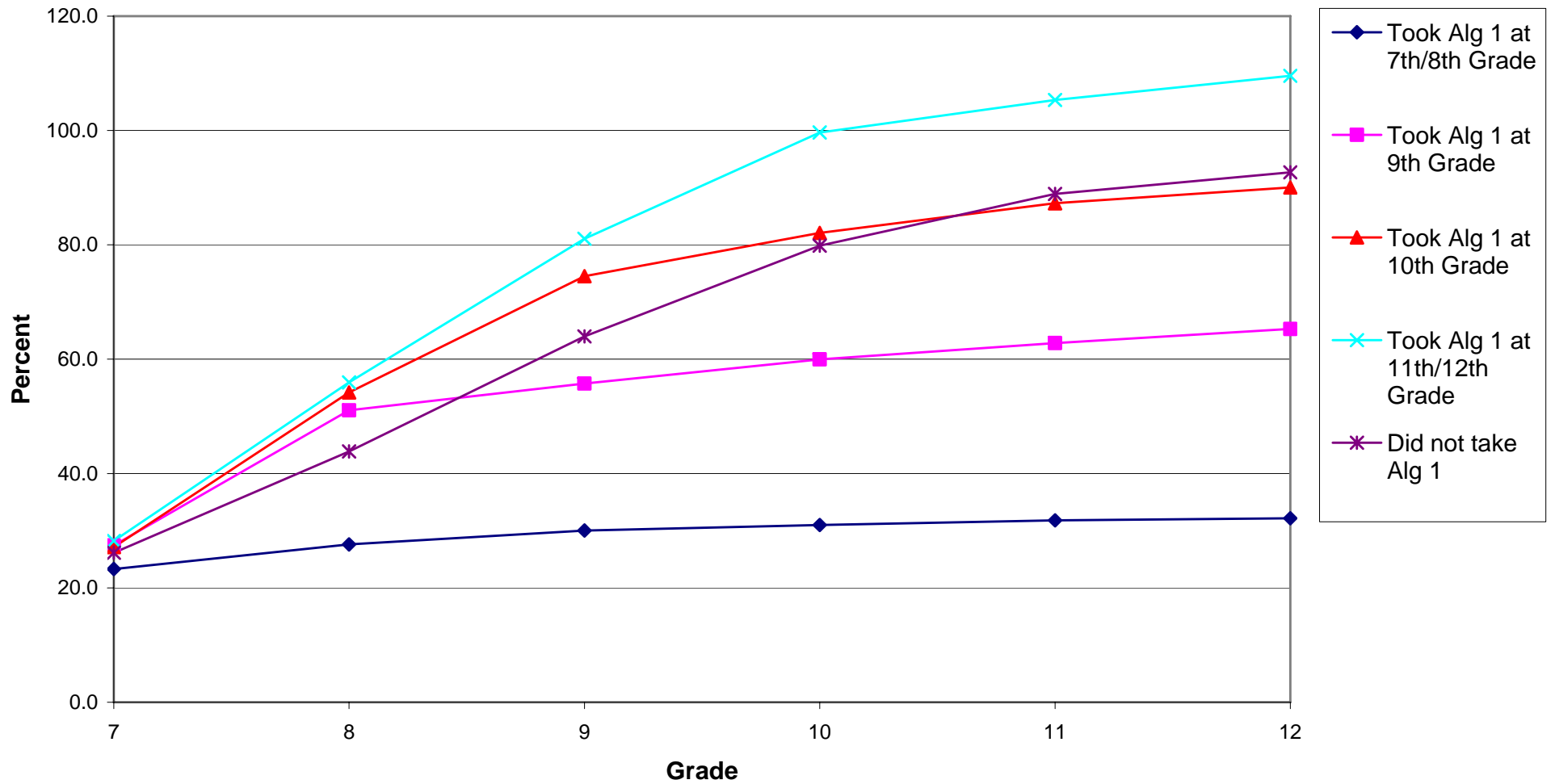
## College Preparatory Standards?

- One course in each:  
**Mathematics, Biology, Chemistry, Physics**
- **Pre-Calculus/Biology/Chemistry/Physics**
  - Less than 20 % of ALL Students
  - Less than 2 % of Voc/Tech Students
  - About 10 % of General Academic Students
  - About 30 % of College Preparatory Students

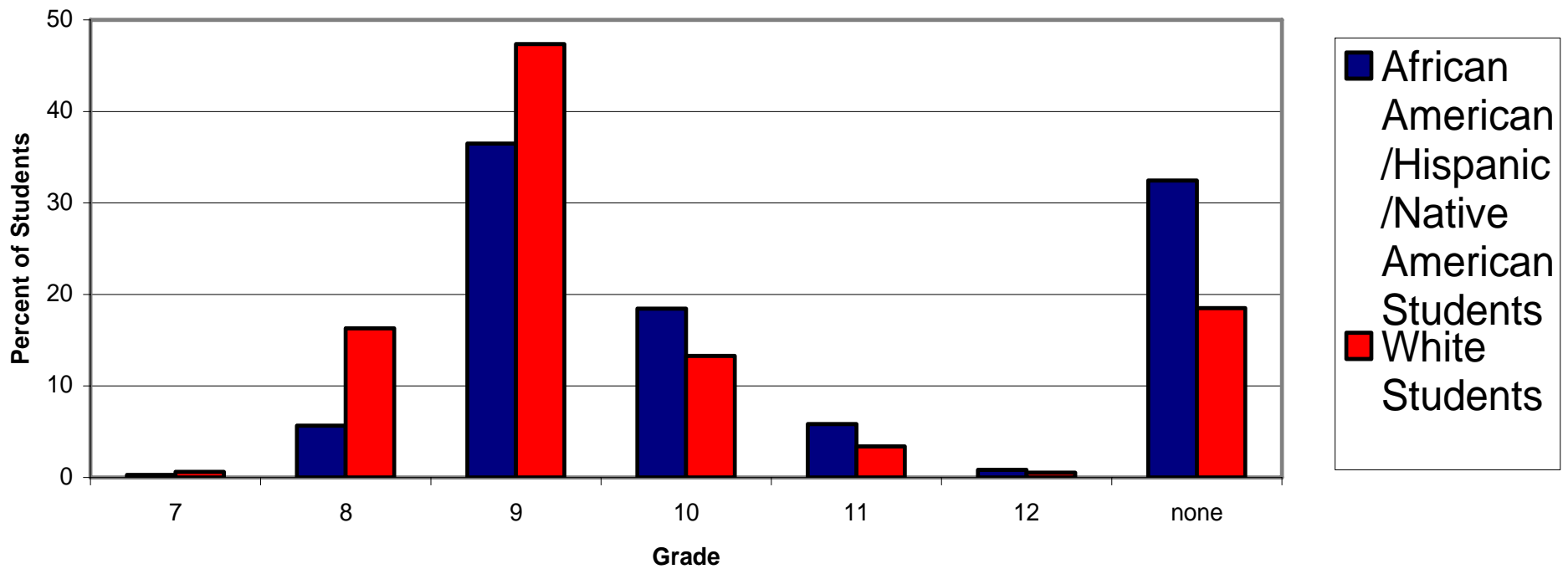
# Cumulative Amount of Algebra in Curriculum



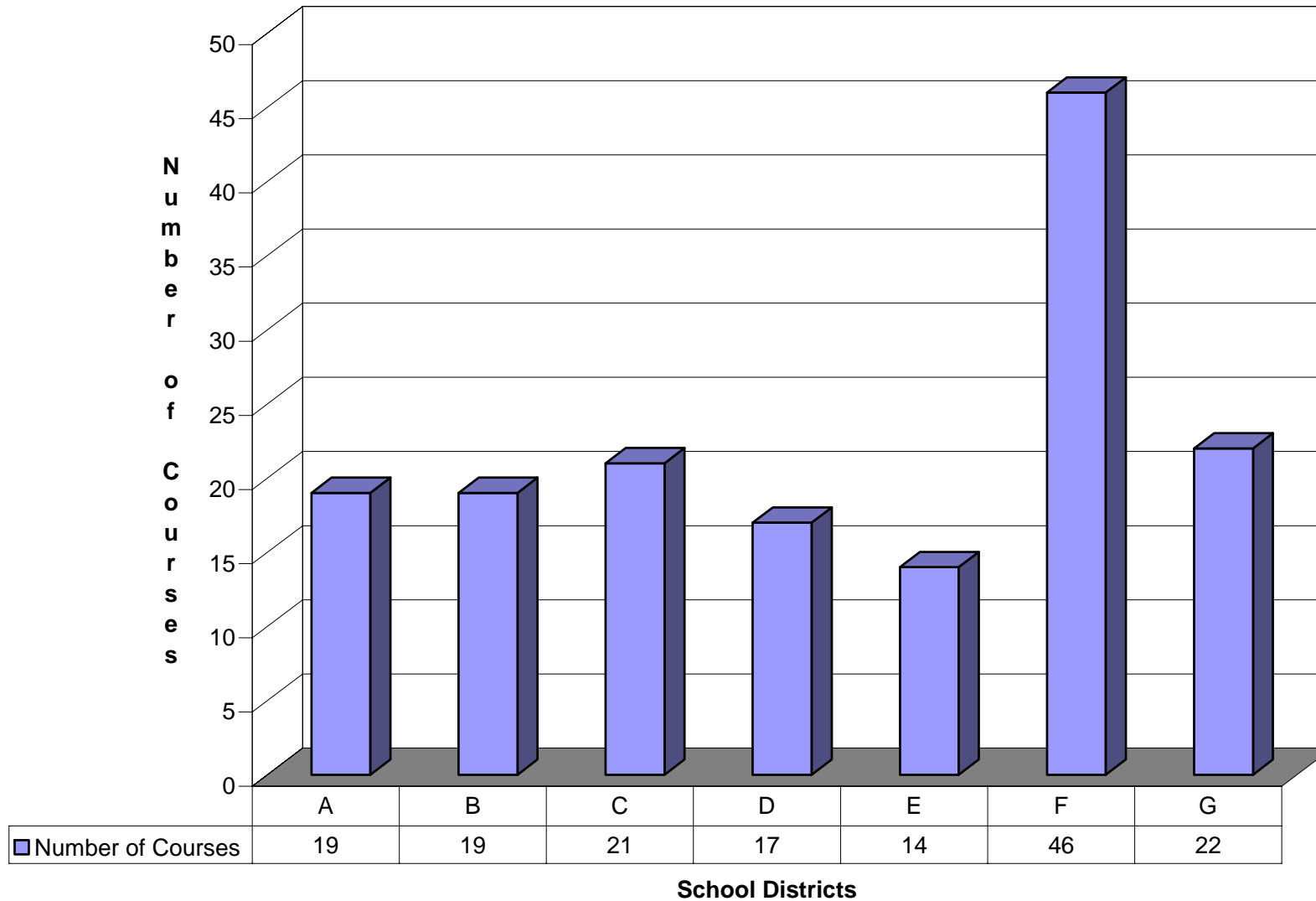
# Cumulative Amount of Fractions in Curriculum



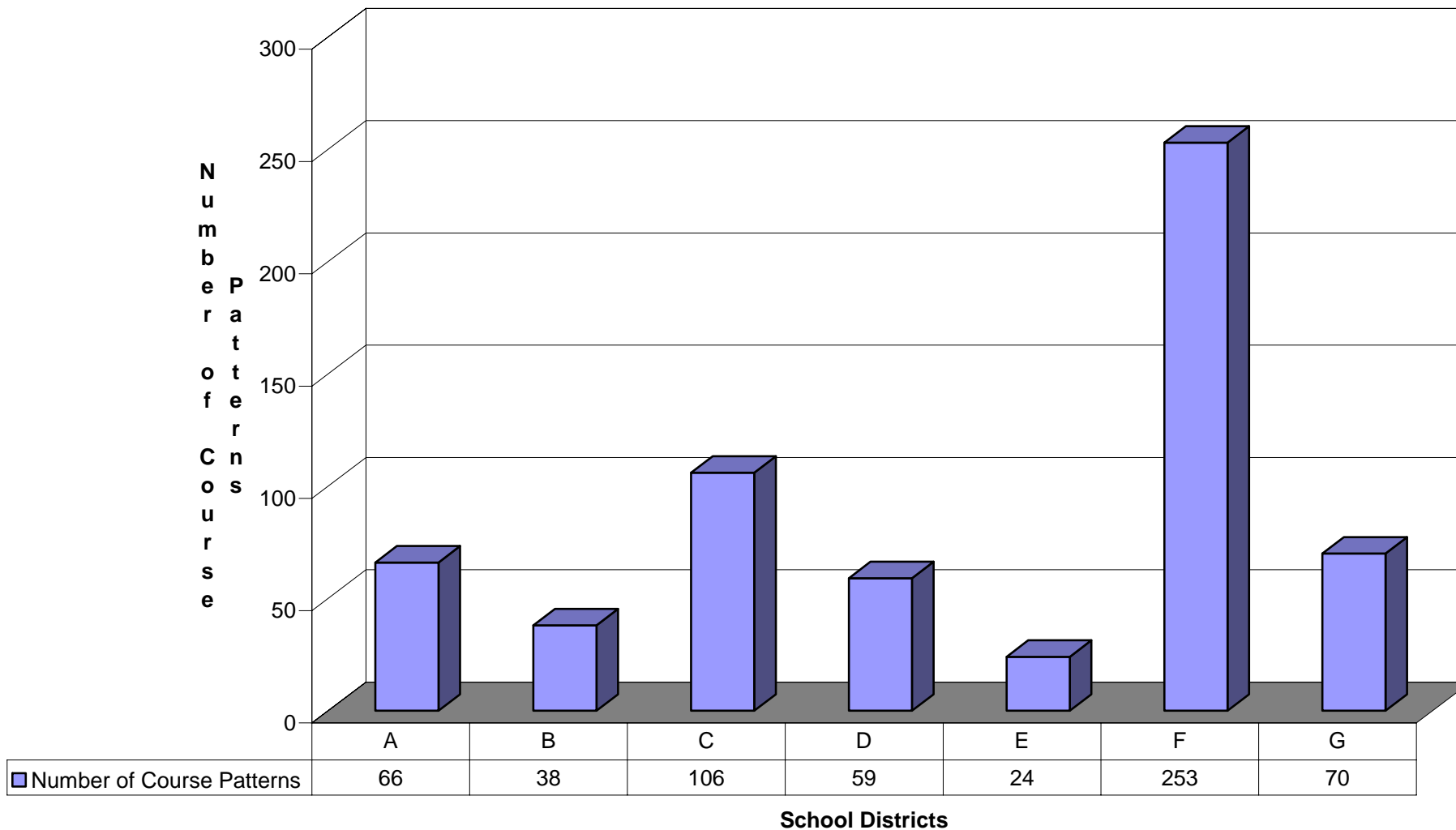
# Percent of Students Taking Algebra I for the First Time



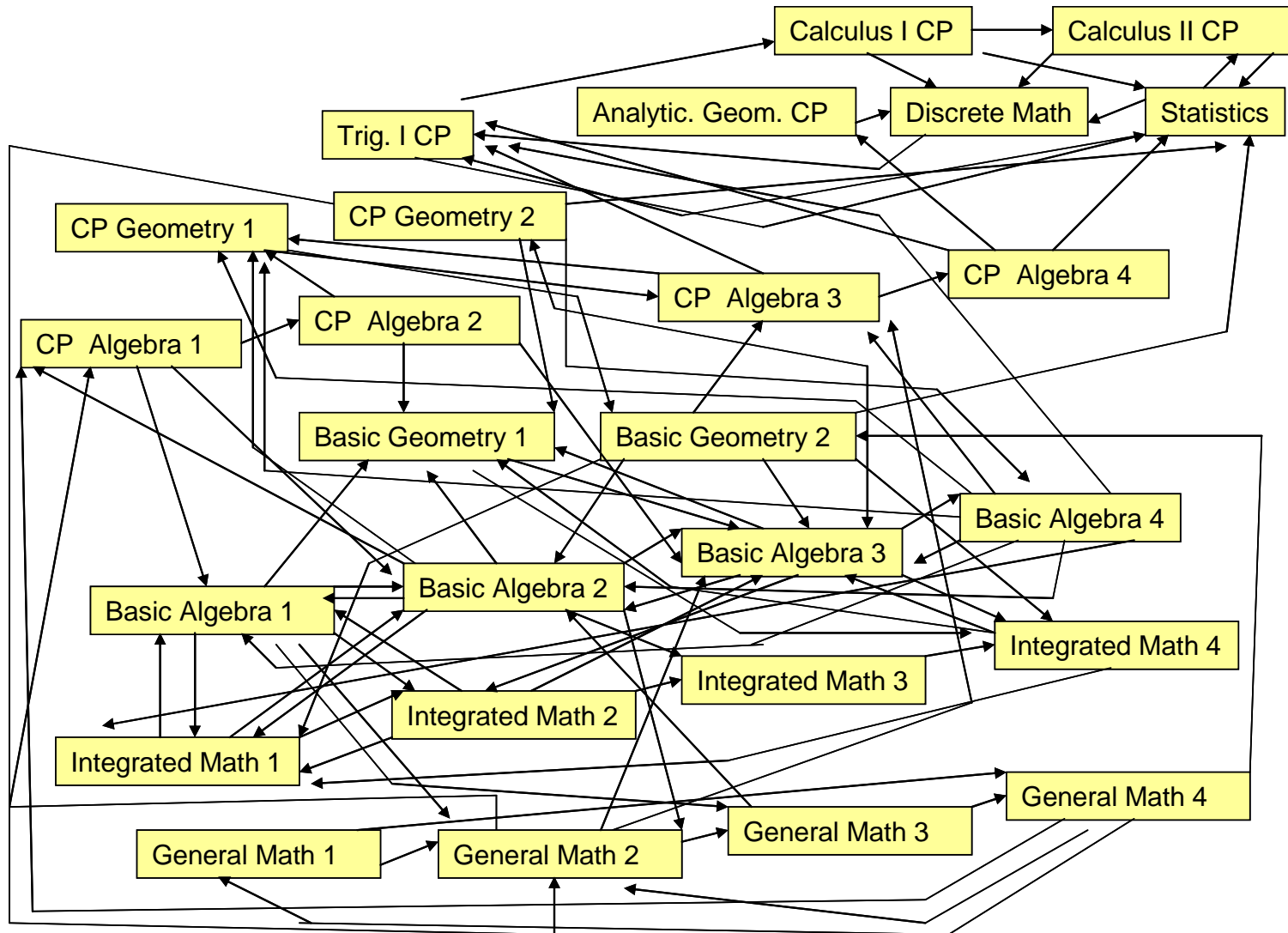
# Number of Mathematics Courses Offered in 7 Districts



# Number of Course Patterns for Meeting High School Mathematics Requirement in 7 Districts

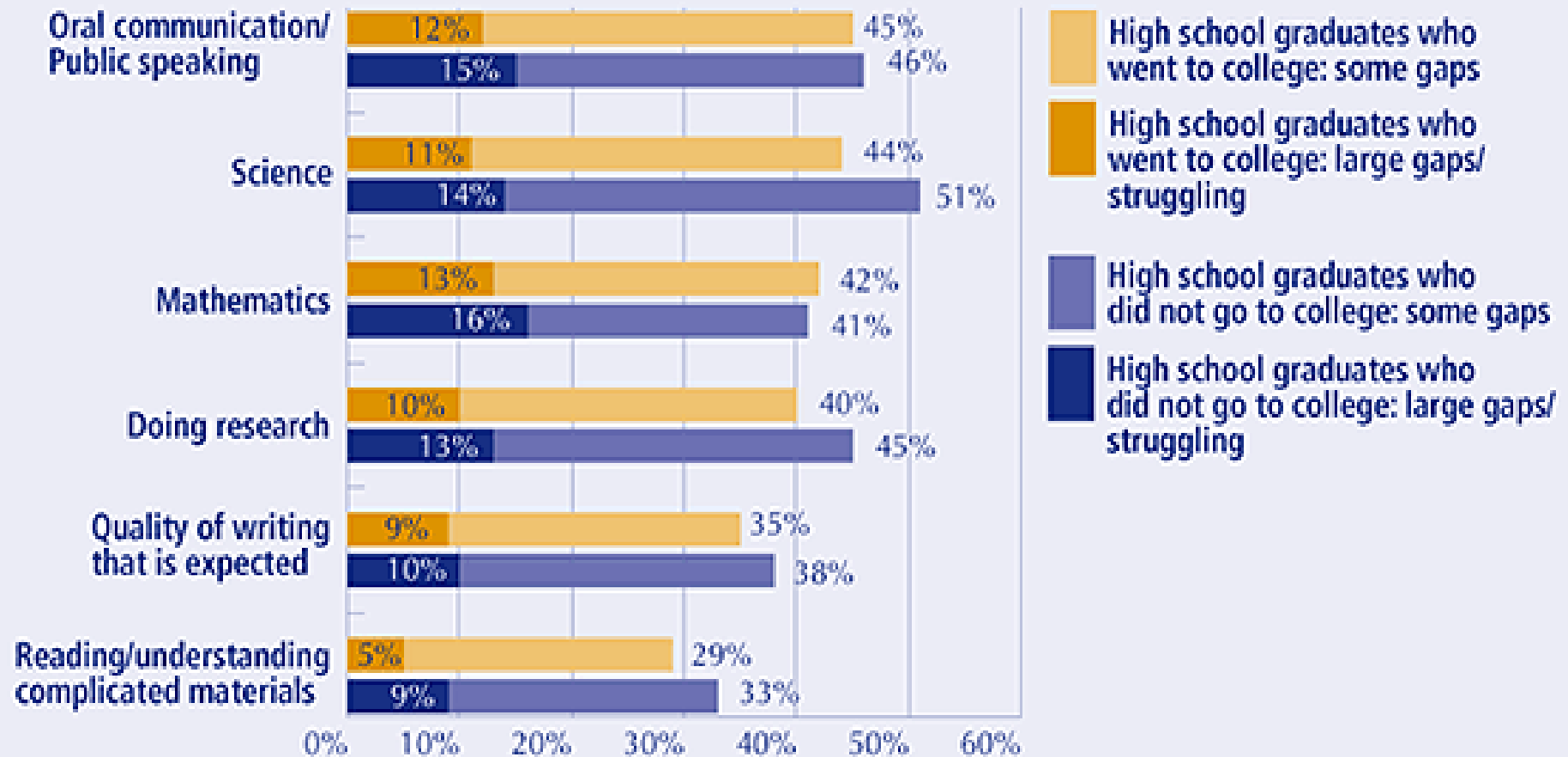


# Diagram of Mathematics Course-Taking Sequences in District F



# Many High School Graduates Report Gaps in Their Preparation

*In each area, percentage saying there are at least some gaps in their preparation*



*Source: Peter D. Hart Research Associates, Inc./Public Opinion Strategies, Rising to the Challenge: Are High School Graduates Prepared for College and Work? Prepared for Achieve, Inc., 2005.*