

FALL 2011 MATHEMATICS SOL INSTITUTES

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Trends in SOL Test Scores

Mathematics SOL Performance - Grades 3-5



Trends in SOL Test Scores

Mathematics SOL Performance - Grades 6-8





Trends in SOL Test Scores

Mathematics SOL Performance - EOC



SOL Institutes – FOCUS



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Vertical Articulation Documents

	Kindergarten		0	Grade 1		Grade 2		Grade 3	
Value	K.1 given two sets ID/describ having more/fewer/same nu members/1-1	e one set as mber of	1.1 a) count/write i up to 100 objects ir numeral - place val	numbers to 100; b) group nto tens/ones and write lue	2.1 a) read/w numeral; b) ro nearest ten; c numbers 0-99	rite/ID place value in 3-digit ound 2-digit numbers to) compare two whole 19 w/symbols/words	3.1 a) rea value/val numbers 10/100/1	ad/write 6-digit numerals, ID place lue of each digit; b) round whole 9,999 or less to nearest 1000; c) compare two whole	
unting/ iality/Place	Grade 3 3.1 a) read/write 6-digit nume value/value of each digit; b) r numbers 9,999 or less to near 10/100/1000; c) compare two	erals, ID place ound whole rest o whole	4.1 a) ID orally/in w each digit in a who millions; b) compar through millions w,	Grade 4 writing place value for le number through re two whole numbers / symbols; c) round	5.1 round dee nearest whol	Grade 5 cimal through thousandths to e number/tenth/hundredth		Grade 6	
ounting/ rdinality/	Grade 5 5.1 round decimal through the nearest whole number/tenth/	ousandths to hundredth	G	irade 6		Grade 7		Grade 8	
	Content	from Earlier Gr	ades	Alge	bra I	Algebra, Functions, Data	Analysis	Algebra 2	
		8.17 ID d variable	omain, range, indep,	/dep A.7 investigate/ar (linear/quad) fam characteristics (al)	alyze function ilies and g/graph) - a)	AFDA.1 investigate/analyz function (linear/quad/exp, families/characteristics - a	e /log)) w/min: c)	All.7 investigate/analyze functions (alg/graph) a) domain/range; b) zeros;	
	Content from Earlier Grades			Algebra I				Geometry	
						 G.1 The student will construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include a) identifying the converse, inverse, and contrapositive of a conditional statement; b) translating a short verbal argument into symbolic form; c) using Venn diagrams to represent set relationships; and d) using deductive reasoning. 			
	8.6 a) verify/describe relations among vertical/adjacent/ supplementary/complementar angles;		ibe relationships ijacent/ omplementary	A.6 graph linear equation inequal (2 vars) - a) deter of line given equation or line or two points on line	(uations/linear) determine slope ion of line/graph of on line - slope as b) verify the parallelism, using algebraic and coordinate meth		ps between angles formed by two rallel; c and coordinate methods as well as		

Mathematics SOL Institutes – Focus

- Five goals for students to
 - become mathematical problem solvers that
 - communicate mathematically;
 - reason mathematically;
 - make mathematical connections; and
 - use mathematical representations to model and interpret practical situations

Virginia's Goals for Students

Process Goals:

- Mathematical Problem Solving
- Mathematical Communication
- Mathematical Reasoning
- Mathematical Connections
- Mathematical Representations

National Council of Teachers of Mathematics

Process Standards:

- Problem Solving
- Reasoning and Proof
- Communication
- Connections
- Representations

Standards for Mathematical Practice (CCSS)

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.

Standards for Mathematical Practice (CCSS)

- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Process Standards

VIRGINIA (Process Goals)	NCTM (Process Standards)	CCSS (Mathematical Practices)
Mathematical Problem Solving	Problem Solving	1) Make sense of problems and persevere in solving them.
Mathematical Communication	Communication	3) Construct viable and critique the reasoning of others
Mathematical Reasoning	Reasoning and Proof	2) Reason abstractly and quantitatively
Mathematical Connections	Connections	 7) Look for and make use of structure 8) Look for and express regularity in repeated reasoning
Mathematical Representations	Representations	4) Model with mathematics
		5) Use appropriate tools strategically
		b) Allend to precision

So why address process skills?

- Most important leverage point to facilitating student understanding and long-term retention
- Few measures in the primary grades
- Potential complacency in "high" test scores at some levels
- Can be a school/subject-wide focus



MATHEMATICS THROUGH PROBLEM SOLVING

VERSUS

MATHEMATICS FOR PROBLEM SOLVING

Mathematics through problem solving

- Interactions among students and the teacher
- Communication of mathematical ideas by students
- Students analyzing, interpreting, and developing processes for solving "rich" mathematical tasks
- Teachers facilitating learning by asking strategic questions and building on ideas that students bring to mathematical tasks
- Teachers facilitating students' sharing of ideas, processes, and conclusions

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'Train-the-trainer' Professional Development

- Four representatives from each division
- Expectation is for participants to return to divisions and provide PD to division teachers and administrators
- Participants will be provided resources for the facilitation of PD
- Each division will receive two PD books







Mathematical Process Goals - "Student Look-fors"

School: Tead	:her(s):	Course/Period:	Start/E							
Mathematical Topic(s):										
Mathematical Problem Solving	Mathematical Communication	Mathematical Reasoning	Mathematics							
 Understand the meaning of the problem and look for entry points to its solution Analyze information (givens, constraints, relationships, goals) Make conjectures and plan a solution pathway Monitor and evaluate the progress and change course as necessary Check answers to problems and ask, "Does this make sense?" Comments: 	 Use definitions and previously established causes/effects (results) in constructing arguments Make conjectures and use counterexamples to build a logical progression of statements to explore and support their ideas Communicate and defend mathematical reas oning using objects, drawings, diagrams, actions Listen to or read the arguments of others Decide if the arguments of others make sense and ask probing questions to clarify or improve the arguments Comments: 	 Make sense of quantities and relationships in problem situations Represent abstract situations symbolically and understand the meaning of quantities Create a coherent representation of the problem at hand Consider the units involved Flexibly useproperties of operations Continually evaluate the reasonableness of intermediate results 	 Apply prior: problems Look for pat quantities ca Recognize th models and solving relat View comple objects or co operations to Notice repeases methods and based on fin Comments: 							
Mathematical Representation	Use appropriate tools strategically	Mathematical Precision	A 11111							
 Apply prior knowledge to solve real world problems Identify important quantities and map their relationships using such tools as diagrams, tables, graphs, flowcharts, and formulas Make assumptions and approximations to make a problem simpler Represent abstract situations symbolically and understand the meaning of quantities Check to see if an answermakes sense within the context of a situation and change a model when necessary Comments: 	 Make sound decisions about the use of specific tools. Examples might include: Calculator Concrete models Digital Technology Pencil/paper Ruler, compass, protractor Use technological tools to visualize the results of assumptions, explore consequences and compare predications with data Use technological tools to explore and deepen understanding of concepts Comments: 	 Communicate precisely using clear definitions State the meaning of symbols, carefully specifying units of measure, and providing accurate labels Calculate accurately and efficiently, expressing numerical answers with a degree of precision Provide carefully formulated explanations Label accurately when measuring and graphing Comments: 	- Additional comi							



Assessments – Then and Now

The table shows the number of pounds of recycled paper collected at two elementary schools.

Paper Collected

Quinn had 354 rings in his store. He sold 138 of these rings. Then he bought 96 more rings. What is the total number of rings he has in his store?

- **A** 120
- **₿** 216
- **C** 312
- D 588
 - **G** 619 pounds
 - **H** 1,030 pounds
 - **J** 1,040 pounds

NEW

OLD

VIRGINIA DEPARTMENT OF EDUCATION Assessments – Then and Now What is $\frac{4}{5} + \frac{3}{5}$? Devo <u>3</u> 5 <u>4</u> 5 • A $\frac{3}{7}$ What • **B** $\frac{7}{10}$ \bigcirc **C** $1\frac{2}{5}$ NEW • **D** $2\frac{2}{5}$ 21 Grade 3





Assessments – Then and Now



Assessments – Then and Now

This stem-and-leaf plot represents the numbers of lollipops sold by students during a fundraiser.



Key 1|4 means 14 lollipops

Construct a histogram that could represent the same set of data.

Directions: Click on a location above each bar to show the bar height.



Assessments – Then and Now

Identify each function that has exactly one zero.

$$f(x) = 9x^{2} - 4$$
$$g(x) = 9(x - 8)$$
$$h(x) = x^{2} + 4x + 8$$
$$j(x) = x^{2} - 8x + 16$$
$$k(x) = -2(x + 4)(x + 1)$$

Directions: Click on t each function you w must select all corre

Assessments – Then and Now





Assessments – Then and Now

A cylinder has a diameter of 10 inches and a height four times its radius. What is its volume?

A cylinder has a volume of 300π cubic centimeters and a base with a circumference of 10π centimeters. What is the height of the cylinder?

- A 30 cm
- B 15 cm
- C 12 cm
- 🖻 **D** 3 cm

NEW

Assessments – Then and Now



New Content - Geometry



How will instruction in your division, school, or classroom need to change?



Enjoy your day!