

HS Math Presentation Addendum

February 11, 2010

Discovering Mathematics

Pros

- Embedded Activities and Investigations, so that all students have access to rich instruction
 - *Parents want same experience across the district (fidelity)*
- Problems are authentic and interesting, and include high levels of cognitive demand
- Many rich online resources for students, parents and teachers
- Better Professional Development provided

Cons

- Less Practice embedded in the text
 - *Teachers will need to use the supplemental materials provided in the program to augment drill and practice*
- Level of difficulty may be too high for some students
 - *As with all curricula, teachers will need to support these students*

Holt

Pros

- More Skill Practice
- Many online resources for students, families and teachers

Cons

- Investigations not embedded
 - *District-wide fidelity a challenge if teachers have to develop investigation activities.*
 - Does not fit the Charter
- Problems are not at as high a level of cognitive demand
- Online resources are procedural and skills based

Why Discovering and not Holt in Issaquah?

- Discovering has high quality activities and explorations embedded in the text book and instruction.
- The problems in Discovering are more authentic and interesting, and are at a higher level of cognitive demand than those found in Holt.
- Discovering provides more and better designed Professional Development for teachers and administrators than Holt.

What needs to be supplemented in each program?

- **Holt:** teachers would have to design activities and investigations to help all students develop deep understanding. It would be difficult to be sure that all teachers across the district deliver the same experience to their students. (Investigation activities are more difficult to develop and implement.)
 - *This is difficult, and potentially costly, to do*
- **Discovering:** teachers will use the supplemental resources within the program to create extra worksheets for needed drill and practice.
 - *This is easy, and allows teachers to create practice that targets specific student needs*

Why go with a program that the State Board study says is unsound?

- The State Board Study, conducted by Strategic Teaching, is one of several conflicting studies. In his memo, Superintendent Dorn states that more studies should be done, but there is no funding.
- Strategic Teaching's study found none of the programs it reviewed to be mathematically sound.
- The study also finds flaws with Holt and has positive things to say about Discovering.
- The study focused on a narrow range of math topics at each grade level.
- On one point where they discredit Discovering, they site the wrong book.

Why go with Discovering when OSPI recommended Holt?

- In his recommendation, Superintendent Dorn states that:
“The final recommendation for high school is: Holt Mathematics. Please note that OSPI has recommended the math curricula as per the legislated requirement. It is not the role of OSPI to direct which curricula a school district may or should select. It is not a state requirement for any district to specifically use the recommended curricula...”

“The board recommended additional work be done to reconcile differences in two different reviews conducted by OSPI and SBE. In light of unprecedented budget shortfall, funds for continuing this work are not currently available and no further study was possible.”

Randy Dorn

[Memorandum No M028-09](#)

Why go with a program that a judge ruled against in a lawsuit in Seattle?

- Issaquah's process was thorough and complete- not arbitrary or capricious.
- The inquiry based programs already in place in Issaquah are producing excellent results.
- Issaquah's ELL and minority students are outperforming their counterparts across the state.

Why go with a program that disadvantages poor, minority and ELL students?

- There is no evidence that Discovering disadvantages these students.
- In Issaquah, our data show that we consistently do a better job of meeting the needs of these students than the state or most other district do, though we want to continue to improve in this area.
- Research in inquiry-based mathematics education is showing that “Performance gaps between whites and underrepresented minorities, and between low- and high-SES students, though not eradicated, are far less dramatic than those typical of traditional curricula.” (Schoenfeld, A., 2002, p. 22)

Questions?

High School Math Adoption

IMC Presentation

January 28, 2010

Big Picture:

- Overview of the timeline of the process
- In-depth look at the process
- In-depth look at the materials

Timeline:

- July 2008 – New Washington State Standards for Algebra, Geometry and Algebra 2 approved
- Jan 15, 2009 – OSPI Released Initial Mathematics Core Comprehensive Materials Review and Recommendations Report
- February – Math Department Chairs and Teachers conducted Standards Study – Recommended a Materials Review
- March – High School Math Materials Adoption Workgroup Chartered to “review and select a cohesive, comprehensive, standards based high school math program.”
- June – Workgroup reached consensus and presented to IMC
- Process Extended

Timeline Continued:

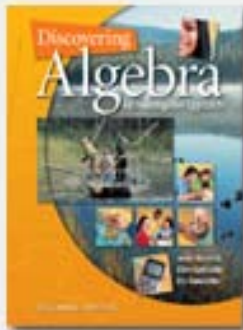
- August 2009 – Math Teachers work to bridge gap between current HS Math Materials and 2008 HS Math Standards
- September 2009
 - Parents and Students Surveyed
 - OSPI Contacted
 - Key Communicators meet to help form math plan
- October – November 2009
 - Math Conversation Nights held at all comprehensive High Schools
- January 2010 – Workgroup reconvened and unanimously reaffirmed recommendation of *Discovering Mathematics*

Unanimous Recommendation: Key Curriculum Press

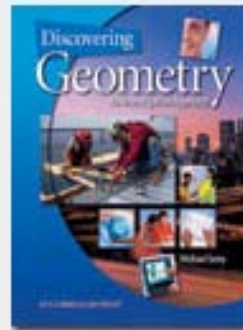
Discovering Algebra

Discovering Geometry

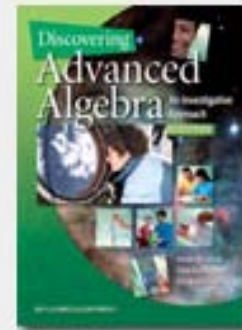
Discovering Advanced Algebra



Discovering Algebra



Discovering Geometry



Discovering Advanced
Algebra

High School Math Adoption Workgroup

- Thirteen Teachers
 - Three from each comprehensive high school
 - Three from PCFC
 - One from Tiger
- Ongoing Principal Representation
- Issaquah School District Math Specialist

Charter

Focus on student
achievement as the
paramount priority.

Charter Focus:

- **All Students**
- **Cultural Competence**
- **Curriculum Coherence**
- **Articulated Continuity**
- **Standards Based**
- **On-going Assessment Focus**
- **Best Practices in Teaching and Learning**
- **Best Practices in Mathematics Instruction**

WA State Standards:

- An effective mathematics program balances three important components of mathematics:
 - Conceptual understanding (making sense of mathematics)
 - Procedural proficiency (skills, facts and procedures)
 - Problem solving and mathematical processes (using mathematics to reason, think and apply mathematical knowledge)

Additional Research

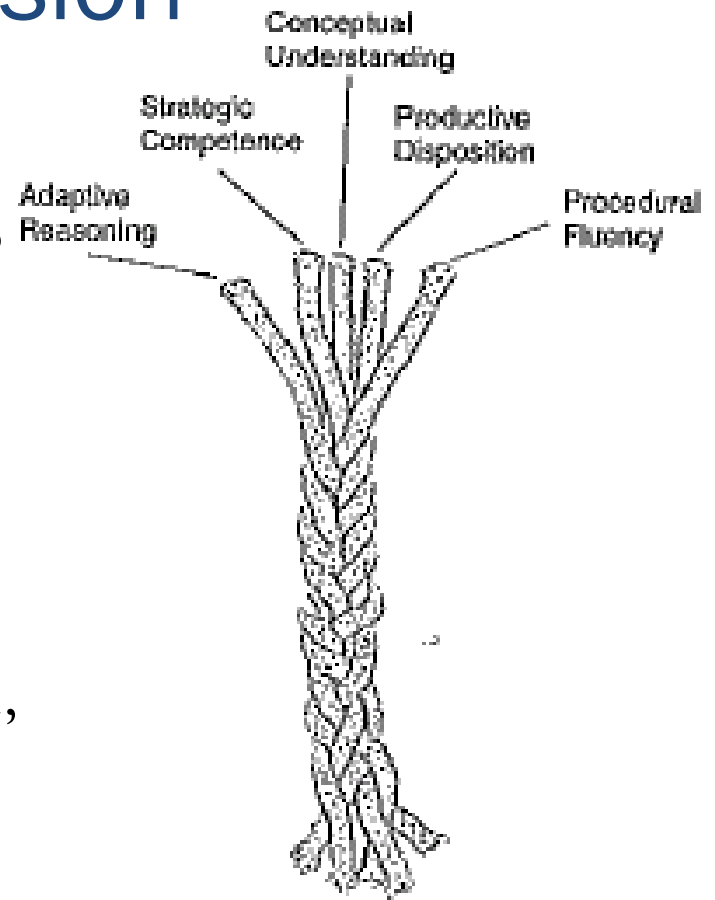
- “Making Mathematics Work for All Children: Issues of Standards, Testing and Equity.” Alan H. Schoenfeld
- “Selecting the Right Curriculum” Mary Kay Stein, Judith Reed, NCTM 2009
- “Effective Teaching for the Development of Skill and Conceptual Understanding of Number: What is Most Effective?”- James Hiebert and Douglas A Grouws
- Chapter 5 from How Students Learn: Teaching and Learning Functions
- “Five ‘Key Strategies’ for Effective Formative Assessment” Dylan William
- Brain Based Teaching – Chapter from Teaching with the Brain in Mind
- “Effective Strategies for Teaching Students with Difficulties in Mathematics” Russell Gersten and Benjamin S. Clarke
- “The Relation between Reform Teaching and Equity in Mathematics Education”

The BIG idea from the research

- In order to know and understand math, students need to have
 - Experiences to develop conceptual understanding
 - Formalization of the experiences into mathematical language
 - Practice to solidify the understanding

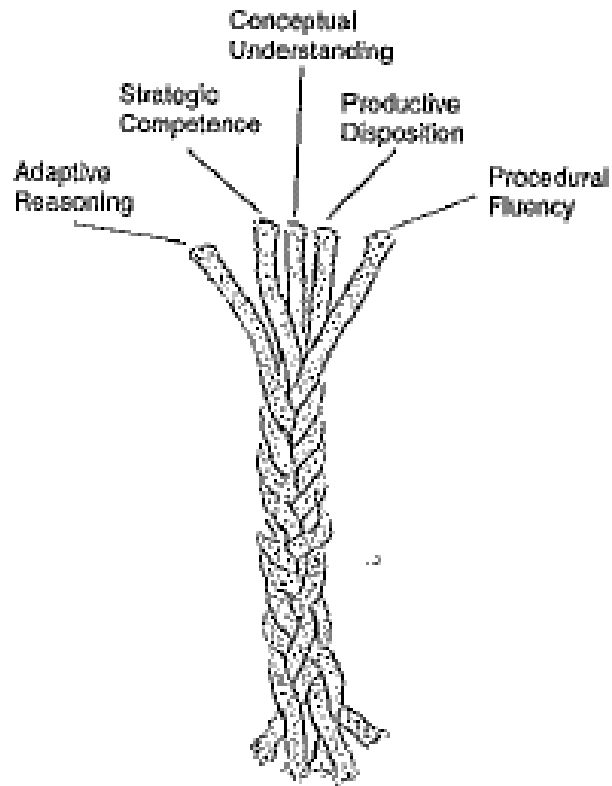
HS Math Materials - Vision

Our goal is for all students to be mathematically prepared and confident to pursue higher education or specialized career training, and to be equipped to apply mathematics as a life tool. To accomplish this goal, every student will become mathematically proficient, as defined by the National Research Council, to include the following five interwoven strands:



Intertwined Strands of Proficiency

HS Math Materials - Vision



Intertwined Strands of Proficiency

- *Conceptual understanding*
- *Procedural fluency*
- *Strategic competence*
- *Adaptive reasoning*
- *Productive disposition*

Therefore, we seek materials which include:

A format that:

- Includes teaching, repetition and reinforcement of skills
- Balances strong basic math fluency with higher level cognitive skills
- Builds in difficulty to increase student confidence
- Problem Solving
- Provides concept fluidity
- Engages and empowers students
- Develops metacognitive abilities and self assessment
- Promotes equity and access
- Appropriately integrates the use of technology
- Includes real-world applications

Therefore, we seek materials which include:

Content that:

- Aligns with the 2008 Washington State Math Standards
 - Content
 - Process
- Continues and extends trigonometry

Support Structures

- Support for students, families and teachers
- Is user friendly and is accessible

The Process:

- Developed rubrics, based on Vision, for
 - Initial Screening
 - In-Depth Screening
- Screened eight sets of materials with initial screening tool:
 - Top materials from the State Core Materials Review
 - Materials that followed our Middle School and Elementary materials
- Chose three sets of materials for in-depth screening:
 - Discovering Mathematics
 - Holt Mathematics
 - Prentice Hall Mathematics

In-depth Screening

- After screening with the In-depth screening rubric, the group decided to continue to examine two sets of materials:
 - Discovering Mathematics
 - Holt Mathematics
- Continued in-depth screening

What students said about DM:

- I like that there is a lot of information – as well as demonstrations of how to apply the concept.
- It was easy to follow.
- It explains clearly and deeply
- There were problems to practice and also apply to word problems and scenarios
- The examples were helpful
- There were hints and answers in the back of the book
- I liked it!

What students said about the other program....

- Lots of repetition
- Boring/Incredibly Boring Math (25 of the 54 we sampled)
 - Not Fun - “Math used to be fun – this is no fun”
 - I like math, but this just made it not as fun.
 - Makes me hate math
- Doesn't explain why to do things, just how
- Not enough creative thinking
- Like Manual labor – doesn't make you think. No inventiveness behind thinking
- Teaches you how to put numbers in your calculator, not how to do math.

What teachers said:

- Lots of teaching resources
- Hands on
- Develops conceptual understanding
- Has worked out examples in every section
- Discovering bridges between Middle School and Pre-Calculus/Calculus

What teachers said:

- DM has embedded high level demand problems...
- Has review problems in each assignment....
- Skill building worksheets...
- DM does a better job of developing the ideas as to the "why" of the ideas.
- DM uses technology regularly and appropriately

Discussion:

- **All Students**
- **Cultural Competence**
- **Curriculum Coherence**
- **Articulated Continuity**
- **Standards Based**
- **On-going Assessment Focus**
- **Best Practices in Teaching and Learning**
- **Best Practices in Mathematics Instruction**

Unanimous Recommendation:

Key Curriculum Press

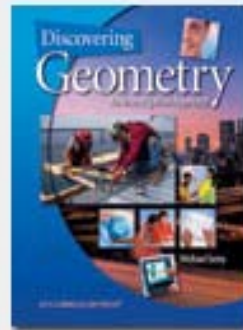
Discovering Algebra

Discovering Geometry

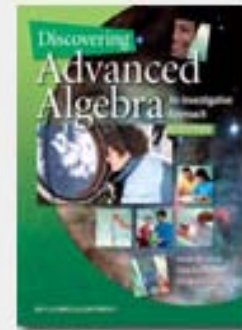
Discovering Advanced Algebra



Discovering Algebra



Discovering Geometry



Discovering Advanced
Algebra

Fall 2009 - September

- Parents and Students Surveyed

	Parents	Students
Middle School	1015	2960
High School	1859	3492
Total	2874	6452

What we learned from the surveys:

- The majority of our parents and students are somewhat or very satisfied with their math experience
- Math success is not significantly impacted by math tutoring
- Students are not using afterschool help as much as we would hope
- Parents need more support in knowing about and using the online tools for helping their students

Fall 2009 - September

- OSPI

The recommendation of Holt is not a state mandate. Local school boards can choose whatever curricula that best meets the need of their students. It is entirely possible that, with supplemental materials, locally chosen curricula can satisfy both criteria: that it is aligned with state standards and mathematically sound.

Alan Burke

Deputy Superintendent of K-12 Education

Fall 2009 - September

- Key Communicators meet to inform math plan
 - PTSA leaders
 - Issaquah Schools Foundation
 - Other active parents and community members

Fall 2009 - October – November Math Conversation Nights

Test Drive Center : Room 138

- What is Key Curriculum Press' *Discovering Mathematics*?
- What about these books will be helpful to my student as he/she learns math?

Committee Process: Room 401C

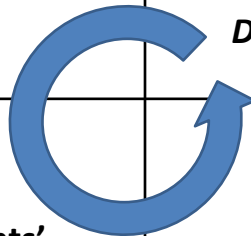
- What process did the Adoption Workgroup follow to reach their recommendation?
- What are their top ten reasons for recommending Key Curriculum Press' *Discovering Mathematics*?

Data Station – Room 401B

- What do we know about Issaquah students' math achievement?
- How do our students do in higher education?
- What did we learn from the parent and student surveys?

Parent Resource Inquiry: Room 402

- What resources are available to me and my student in this program to help us in mathematics?
- I have some questions and thoughts to share....

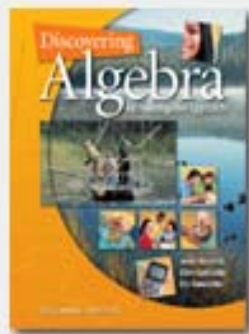


Staff Members will be available in the commons after the last session to answer questions and continue conversations.

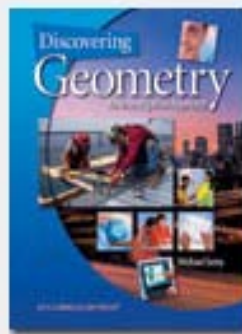
Thank so much for coming!

Winter 2010

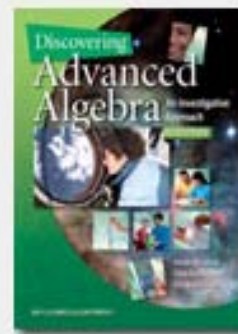
- January 13, 2010 – Workgroup reconvened
 - Reexamined the process
 - Looked at information gathered since June from parents, students, OSPI and community members
 - Unanimously reaffirmed recommendation of *Discovering Mathematics*



Discovering Algebra



Discovering Geometry



Discovering Advanced
Algebra

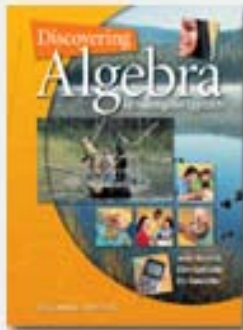
The Materials:

Key Curriculum Press

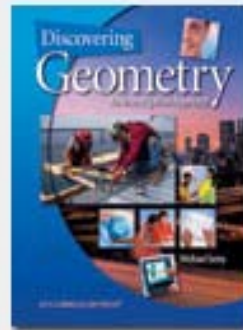
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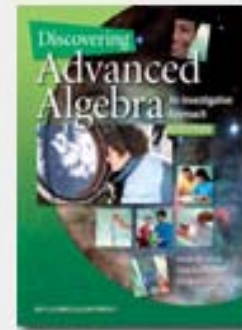
Discovering Advanced Algebra



Discovering Algebra



Discovering Geometry



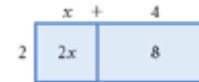
Discovering Advanced
Algebra

Text books – clear examples:

EXAMPLE A | Use the distributive property to write $y = 3 + 2(x + 4)$ without parentheses.

► **Solution**

Before adding 3, distribute the 2 through the sum of x and 4.



$$y = 3 + 2(x + 4)$$

Point-slope equation.

$$y = 3 + 2 \cdot x + 2 \cdot 4$$

Use the distributive property: Distribute 2 through $x + 4$.

$$y = 3 + 2x + 8$$

Multiply $2 \cdot 4$.

$$y = 11 + 2x$$

Combine like terms (add $3 + 8$).

So, $y = 3 + 2(x + 4)$ is equivalent to $y = 11 + 2x$. These are a point-slope equation and an intercept equation for the same line. What does each of the forms tell you about the line it describes?

The distributive property can be generalized like this:

Distributive Property

For any values of a , b , and c , this equation is true:

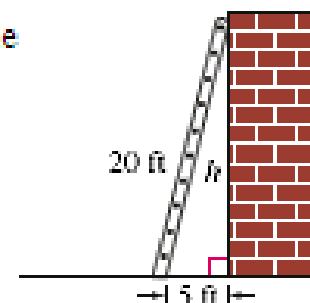
$$a(b + c) = a \cdot b + a \cdot c$$

Text books – clear examples:

Let's look at a few examples to see how you can use the Pythagorean Theorem to find the distance between two points.

EXAMPLE A

How high up on the wall will a 20-foot ladder touch if the foot of the ladder is placed 5 feet from the wall?



► Solution

The ladder is the hypotenuse of a right triangle, so

$$a^2 + b^2 = c^2.$$

$$(5)^2 + (h)^2 = (20)^2$$

Substitute.

$$25 + h^2 = 400$$

Multiply.

$$h^2 = 375$$

Subtract 25 from both sides.

$$h = \sqrt{375} \approx 19.4$$

Take the square root of each side.

The top of the ladder will touch the wall about 19.4 feet up from the ground.

Notice that the exact answer in Example A is $\sqrt{375}$. However, this is a practical application, so you need to calculate the approximate answer.

Text books – clear examples:

EXAMPLE B

Suppose you have 100 mL of a solution that is 30% acid and 70% water.

How many mL of acid do you need to add to make a solution that is 60% acid? To make it a 90% acid solution? Can it ever be 100% acid?

Text books – clear examples:

► **Solution**

Of the 100 mL of solution, 30%, or 30 mL, is acid. The percentage, P , can be written as $P = \frac{30}{100}$. If x milliliters of acid are added, there will be more acid, but also more solution. The concentration of acid will be

$$P = \frac{30 + x}{100 + x}$$

To find when the solution is 60% acid, substitute 0.6 for P and solve the equation.

$$0.6 = \frac{30 + x}{100 + x}$$

Substitute 0.6 for P .

$$0.6(100 + x) = 30 + x$$

Multiply both sides by $(100 + x)$.

$$60 + 0.6x = 30 + x$$

Distribute.

$$30 = 0.4x$$

Collect like terms.

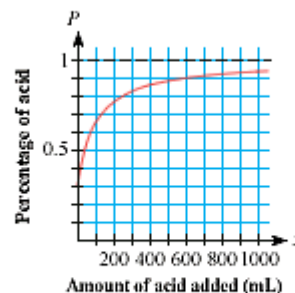
$$75 = x$$

Divide by 0.4.

Adding 75 mL of acid will make a 60% acid solution.

To find when the solution is 90% acid, solve the equation $0.9 = \frac{30 + x}{100 + x}$. You will find that 600 mL of acid must be added.

The graph of $P = \frac{30 + x}{100 + x}$ shows horizontal asymptote $y = 1$. No matter how many milliliters of acid you add, you will never have a mixture that is 100% acid. This is because the original 70 mL of water will remain, even though it is a smaller and smaller percentage of the entire solution as you continue to add acid.



Text books:

- Selected hints and answers in the back
- Glossary
- Definitions, properties and rules made visible

Slope

The formula for the slope between two points, (x_1, y_1) and (x_2, y_2) , is

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

where $x_2 \neq x_1$.

The slope will be the same for any two points selected on the line. In other words, a line has only one slope. Two points on a line can have the same y -value; in that case, the slope of the line is 0. If they had the same x -value, the denominator would be 0 and the slope would be undefined. So the definition of slope specifies that the points cannot have the same x -value. What kinds of lines have a slope of 0? What kinds of lines have undefined slope?

Slope is another word for the steepness or rate of change of a line. If a linear equation is in **intercept form**, then the slope of the line is the coefficient of x .

Intercept Form of the Equation of a Line

You can write the equation of a line as

$$y = a + bx$$

where a is the y -intercept and b is the slope of the line.

Additional Resources:

- Complete worked out solutions manual
- Assessment handbook and CD
- Standardized Test Preparation Handbook
- Teaching and Worksheet masters
- Worksheet builder technology

Additional Resources:

Available online or in paper version:

- Practice Your Skills worksheets
- Condensed Lessons in English and Spanish – additional explanation of each lesson to support students who are absent or need more help
- Parent Guide – gives overview of each chapter

Key Curriculum Press Online book:

data set is **bimodal**.

3. One hundred
like the one at
the circle.

R
radical expressions, 535
discriminants, 568



- Interactive Glossary Terms
- Selected Answers Links
- Interactive Index Terms
- More Practice your Skills Links

Key Curriculum Press Online Text book:

 See Calculator Note 1G <-



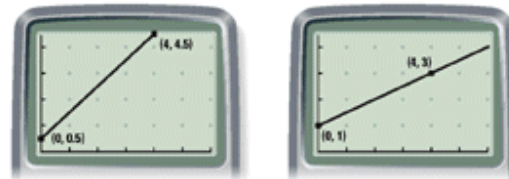
www.keymath.com/DA



- Calculator Note Links
- Chapter-specific Web resources
- Home Page Link
- Fathom Links
- Sketchpad links

Technology: Graphing Calculators and CBRs

In this investigation you'll analyze time-distance graphs, and you'll use a motion sensor to create your own graphs.

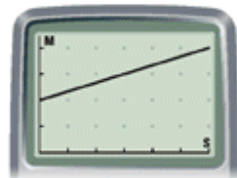


Investigation Walk the Line

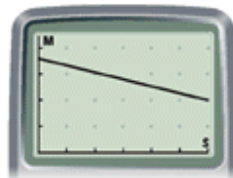
You will need

- a 4-meter measuring tape or four metersticks per group
- a motion sensor
- a stopwatch or watch that shows seconds

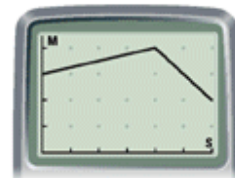
Imagine that you have a 4-meter measuring tape positioned on the floor. A motion sensor measures your distance from the tape's 0-mark as you walk, and it graphs the information. On the calculator graphs shown here, the horizontal axis shows time from 0 to 6 seconds and the vertical axis shows distance from 0 to 4 meters.



a.



b.



c.

Technology: Geometer's Sketchpad

The screenshot displays the Geometer's Sketchpad interface within a Windows Internet Explorer browser window. The browser's address bar shows the URL: <http://www.keypress.com/basals/resources/mod/resource/view.php?id=5458&subdir=/TheGeometersSketchpadResources/Di>. The browser window title is "The Geometer's Sketchpad - [Polygon_Exterior_Angles[1] - Exterior Angle Sum Conjecture]".

The sketchpad window has a menu bar with "File", "Edit", "Display", "Construct", "Transform", "Measure", "Graph", "Window", and "Help". The main workspace is titled "Lesson 5.2 Exterior Angle Sum Conjecture". It features a pentagon with vertices labeled A, B, C, D, and E. Exterior angles are formed by extending the sides, with vertices labeled J, I, F, G, and H. The following angle measures are shown:

- $m\angle JAB = 80^\circ$
- $m\angle FBC = 84^\circ$
- $m\angle GCD = 41^\circ$
- $m\angle HDE = 110^\circ$
- $m\angle IEA = 45^\circ$

The sum of these exterior angles is calculated as:

$$m\angle JAB + m\angle FBC + m\angle GCD + m\angle HDE + m\angle IEA = 360.00^\circ$$

Below the diagram, the text states: "For any polygon, the sum of the measures of a set of exterior angles is 360° ." At the bottom of the sketchpad window, there are navigation buttons for "Exterior Angle Sum Conjecture" and "Equiangular Polygon Conjecture".

The Windows taskbar at the bottom shows the Start button, several open applications (3 M..., 3 W..., 2 M..., Micr..., 3 I...), and the system tray with the time 11:20 AM.

Technology: Fathom

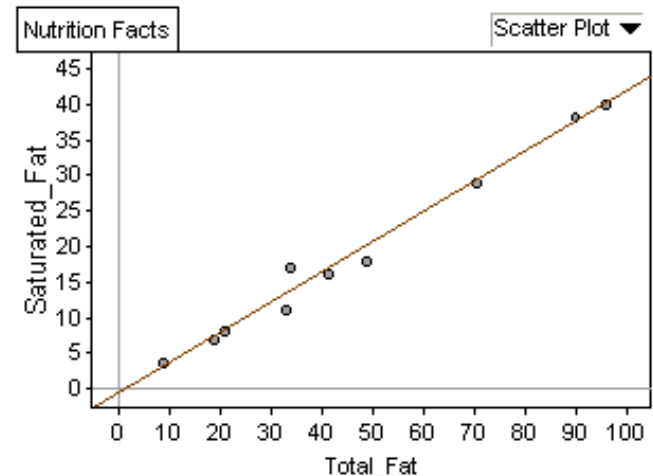
Fathom - [FastFood[1]]

File Edit Display Insert Data Analyze Window Help



Nutrition Facts

	Burger	Saturated_Fat	Total_Fat
1	Burger King Bacon Double Cheesburger	17.0	34.0
2	Burker King Original WHOPPER Sandwich with Cheese	18.0	49.0
3	Hardee's 2/3 lb Double Thickburger	38.0	90.0
4	Hardee's 2/3 lb Bacon Cheese Thickburger	40.0	96.0
5	Jack in the Box Bacon Ultimate Cheeseburger	29.0	70.5
6	Jack in the Box Jumbo Jack w/ Cheese	16.0	41.5
7	McDonald's Big Mac	11.0	33.0
8	McDonald's Quarter Pounder	8.0	21.0
9	Wendy's Jr. Hamburger	3.5	9.0
10	Wendy's Classic Single w/ Everything	7.0	19.0



$$\text{Saturated_Fat} = 0.425\text{Total_Fat} - 0.38$$

Questions?