

# 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:

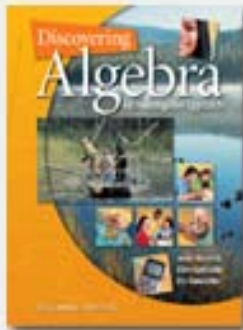
- August 2009 – Math Teachers work to bridge gap between current HS Math Materials and 2008 HS Math Standards
- September 2009
  - Parents and Students Surveyed
  - OSPI Contacted
  - Key Communicators meet to help form math plan
- October – November 2009
  - Math Conversation Nights held at all comprehensive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

# Unanimous Recommendation: Key Curriculum Press

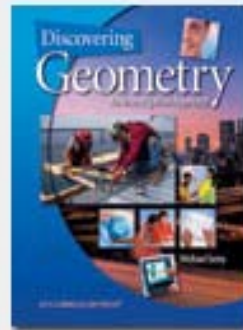
Discovering Algebra

Discovering Geometry

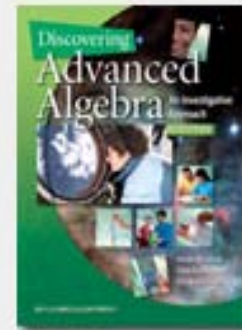
Discovering Advanced Algebra



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

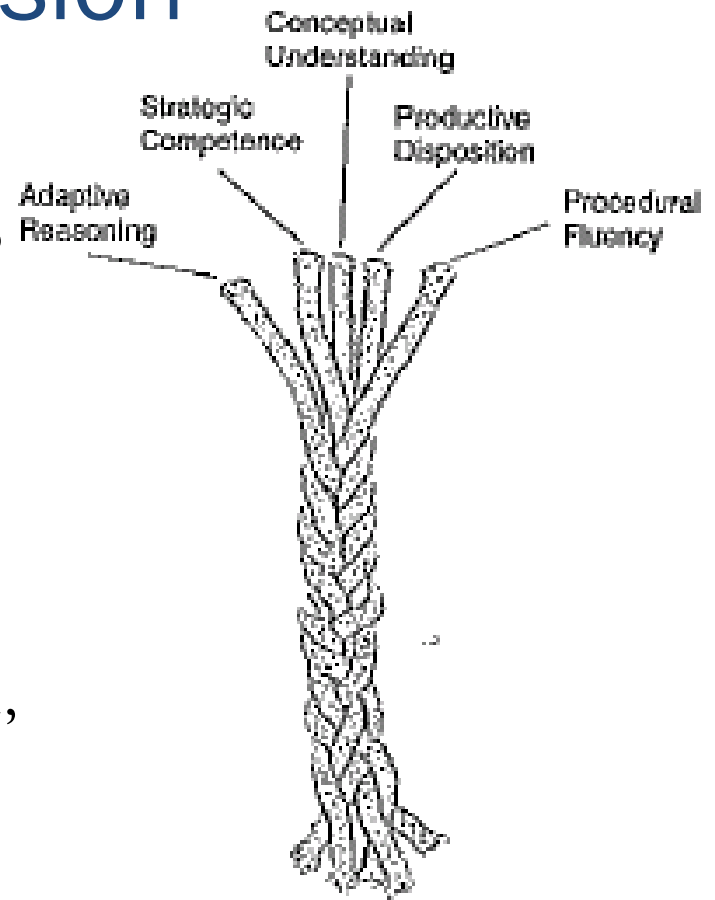
- “Making Mathematics Work for All Children: Issues of Standards, Testing and Equity.” Alan H. Schoenfeld
- “Selecting the Right Curriculum” Mary Kay Stein, Judith Reed, NCTM 2009
- “Effective Teaching for the Development of Skill and Conceptual Understanding of Number: What is Most Effective?”- James 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

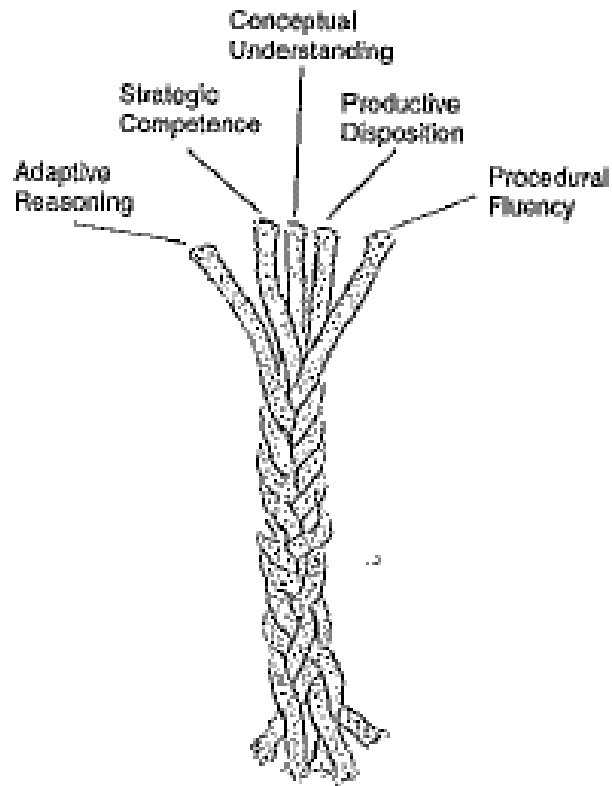
# HS Math Materials - Vision

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**

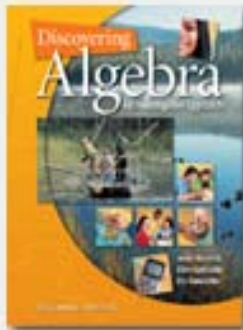
# Unanimous Recommendation:

Key Curriculum Press

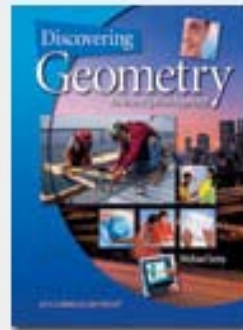
Discovering Algebra

Discovering Geometry

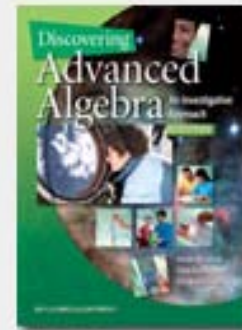
Discovering Advanced Algebra



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Discovering Advanced  
Algebra

# Fall 2009 - September

- Parents and Students Surveyed

	Parents	Students
Middle School	1015	2960
High School	1859	3492
<b>Total</b>	<b>2874</b>	<b>6452</b>

## 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

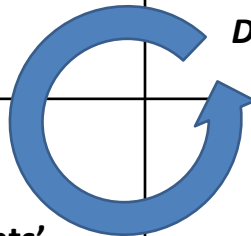
- What process did the Adoption Workgroup follow to reach their recommendation?
- What are their top ten reasons for recommending Key Curriculum Press' *Discovering Mathematics*?

## 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....

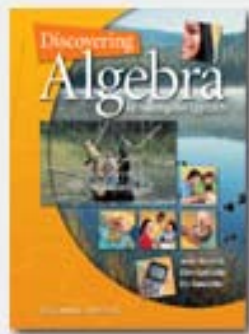


Staff Members will be available in the commons after the last session to answer questions and continue conversations.

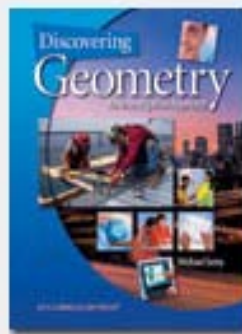
**Thank so much for coming!**

# Winter 2010

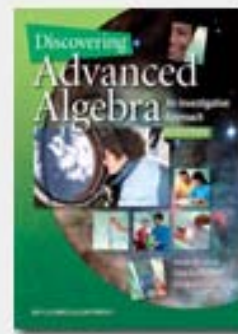
- January 13, 2010 – Workgroup reconvened
  - Reexamined the process
  - Looked at information gathered since June from parents, students, OSPI and community members
  - Unanimously reaffirmed recommendation of *Discovering Mathematics*



Discovering Algebra



Discovering Geometry



Discovering Advanced  
Algebra

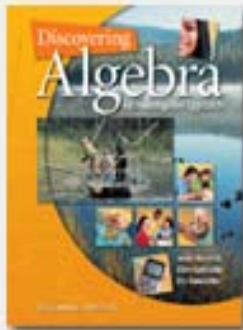
# The Materials:

Key Curriculum Press

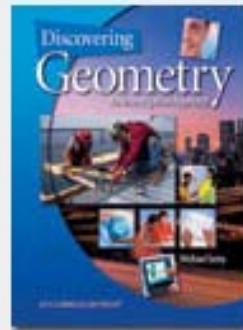
Discovering Algebra

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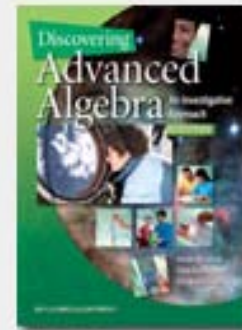
Discovering Advanced Algebra



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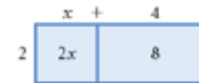
Discovering Advanced  
Algebra

# 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:

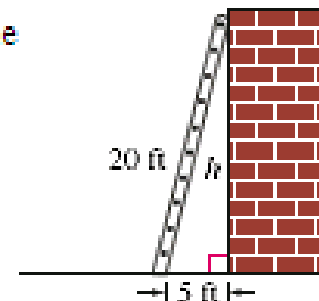
$$a(b + c) = a \cdot b + a \cdot c$$

# 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.

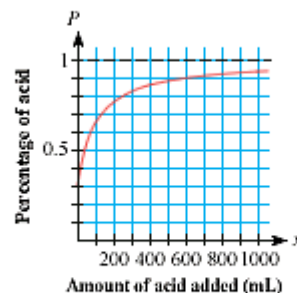
$$75 = x$$

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 <-



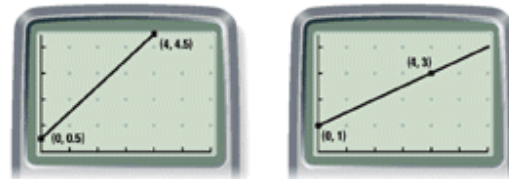
[www.keymath.com/DA](http://www.keymath.com/DA)



- 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.

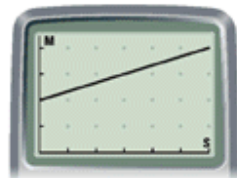


## Investigation Walk the Line

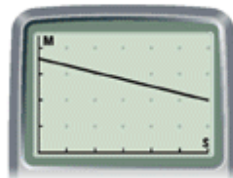
### You will need

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

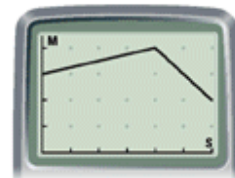
Imagine that you have a 4-meter measuring tape positioned on the floor. A motion sensor measures your distance from the tape's 0-mark as you walk, and it graphs the information. On the calculator graphs shown here, the horizontal axis shows time from 0 to 6 seconds and the vertical axis shows distance 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 A, B, C, D, and E. Exterior angles are formed by extending the sides: JAB at vertex A, FBC at vertex B, GCD at vertex C, HDE at vertex D, and IEA at vertex E. The measures of these exterior angles are given as  $m\angle JAB = 80^\circ$ ,  $m\angle FBC = 84^\circ$ ,  $m\angle GCD = 41^\circ$ ,  $m\angle HDE = 110^\circ$ , and  $m\angle IEA = 45^\circ$ . A large equation states:  $m\angle JAB + m\angle FBC + m\angle GCD + m\angle HDE + m\angle IEA = 360.00^\circ$ .

Below the diagram, the text reads: "For any polygon, the sum of the measures of a set of exterior angles is  $360^\circ$ ." 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 (including "3 M...", "3 W...", "2 M...", "Micr...", "3 I...", and "The..."), a search bar, and the system clock showing "11:20 AM".

# Technology: Fathom

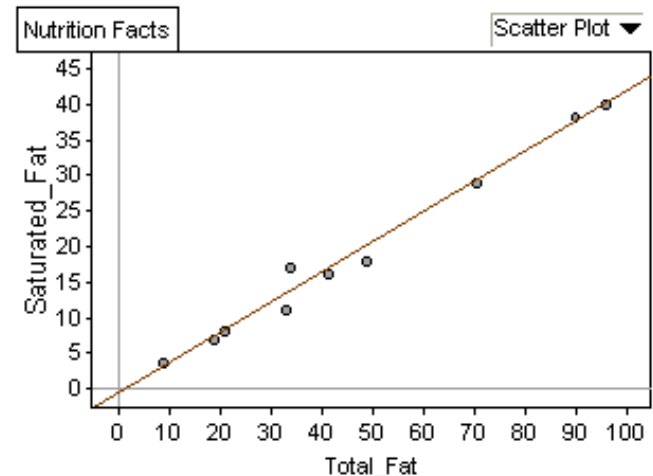
Fathom - [FastFood[1]]

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?