

ART OF MATHEMATICS

DISCOVERING THE
MATHEMATICAL INQUIRY IN THE LIBERAL ARTS

Discovering the Art of Inquiry

Creating a Culture of Asking Open Questions

DAoM Team, Westfield State University

www.artofmathematics.org



DAoM: Mathematical Inquiry in the Liberal Arts (thanks to NSF)

www.artofmathematics.org

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www.artofmathematics.org

Classroom

Faculty Login »

Inquiry-Based Learning

The need for more active involvement of mathematics students in the learning process is well documented. Involvement occurs through the use of inquiry-based learning. The curriculum materials that make up Discovering the Art of Mathematics (DAoM) reverse the typical lecture dynamic by being built on guided-discovery investigations.

DAoM materials focus on **investigations, tasks, experiments, constructions, data collection and discussion prompts** rather than transcribed lectures and worked-out sample problems followed by banks of routine exercises. The transformative impact this has on students in MLA classrooms can be seen clearly in the classroom vignette, student quotes, and videos shown below.

New to Inquiry-Based Learning?

If you are new to Inquiry-Based Learning, come along on a virtual trip into "[Our Inquiry-Based Classroom](#)" or [visit an IBL classroom in person at Westfield State University](#). For a first idea about our classroom materials, turn to our blog "[Good Activities to Start](#)". To explore how we engage our students in Mathematical Conversations, you may enjoy our blog on "[Asking Good Questions](#)". Then follow your interests by diving more deeply into the full listing below.

Classroom

Overview

Getting Started

Mathematics for Liberal Arts

In the Classroom

Investigations

Mathematical Conversations

Proof as Sense-Making

Assessment Techniques

Support





A Culture of Open Questions

Overview

- IBL = Do in class what you want your students to be able to do down the road.
- Experience (this style of) mathematical inquiry
- Explore pedagogical tools and teacher moves that support this style of IBL
- Learn about support for IBL

IBL start task: $3a + 5b$ (for $a, b \geq 0$)

Explore the expression $3a + 5b$ where $a, b \geq 0$ represent whole numbers. Make a note of anything and everything you notice.

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Whole Class Discussion:

$$3a + 5b \text{ (for } a, b \geq 0\text{)}$$

What do you notice?

IBL Conjecture: $3a + 5b$

Investigate this expression until you feel comfortable **making a conjecture** which identifies

exactly which numbers can be made by evaluating the expression $3a + 5b$ for $a, b \geq 0$ being whole numbers.

Whole Class Discussion
 $3a + 5b$ Conjecture

What is a possible conjecture which identifies *exactly which numbers can be made by evaluating the expression $3a + 5b$ for $a, b \geq 0$ being whole numbers?*

IBL Pedagogical Tools

- What pedagogical tools or teacher moves did you notice the facilitator using in this $3a+5b$ inquiry so far?
- Why do you think these particular choices were made?



“Discovering the Art of Teaching” Pedagogical Tools to Support your IBL Practice

- Getting Started with IBL
- Math for Liberal Arts
- In the Classroom
- Investigations/Materials
- Mathematical Conversations
- Proof as Sense-making
- Assessment Techniques
- Support

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Open inquiry: $3a + 5b$ (for $a, b \geq 0$)

- Having worked on this question, what are some mathematical questions you are wondering about?
- What mathematical questions might **your liberal arts students** have after exploring this investigation?

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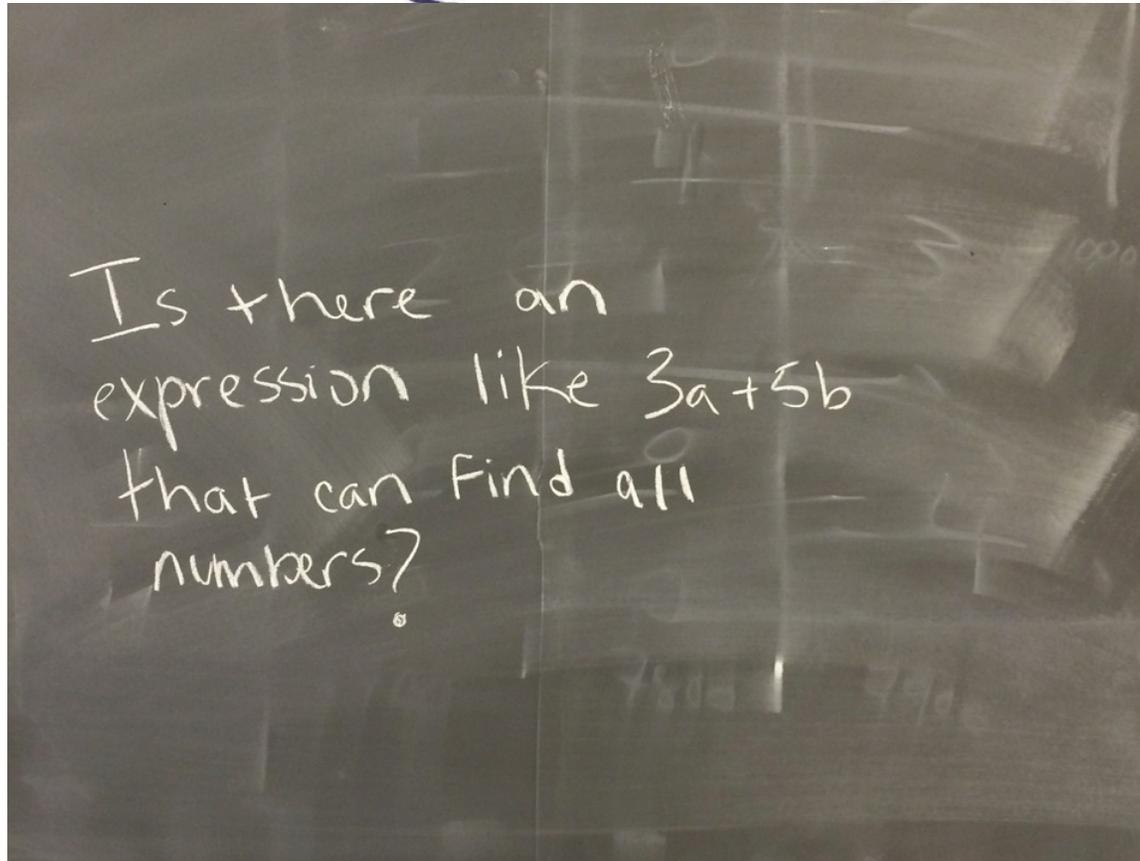
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Whole class discussion: $3a + 5b$

What are some mathematical questions your liberal arts students might be wondering about?

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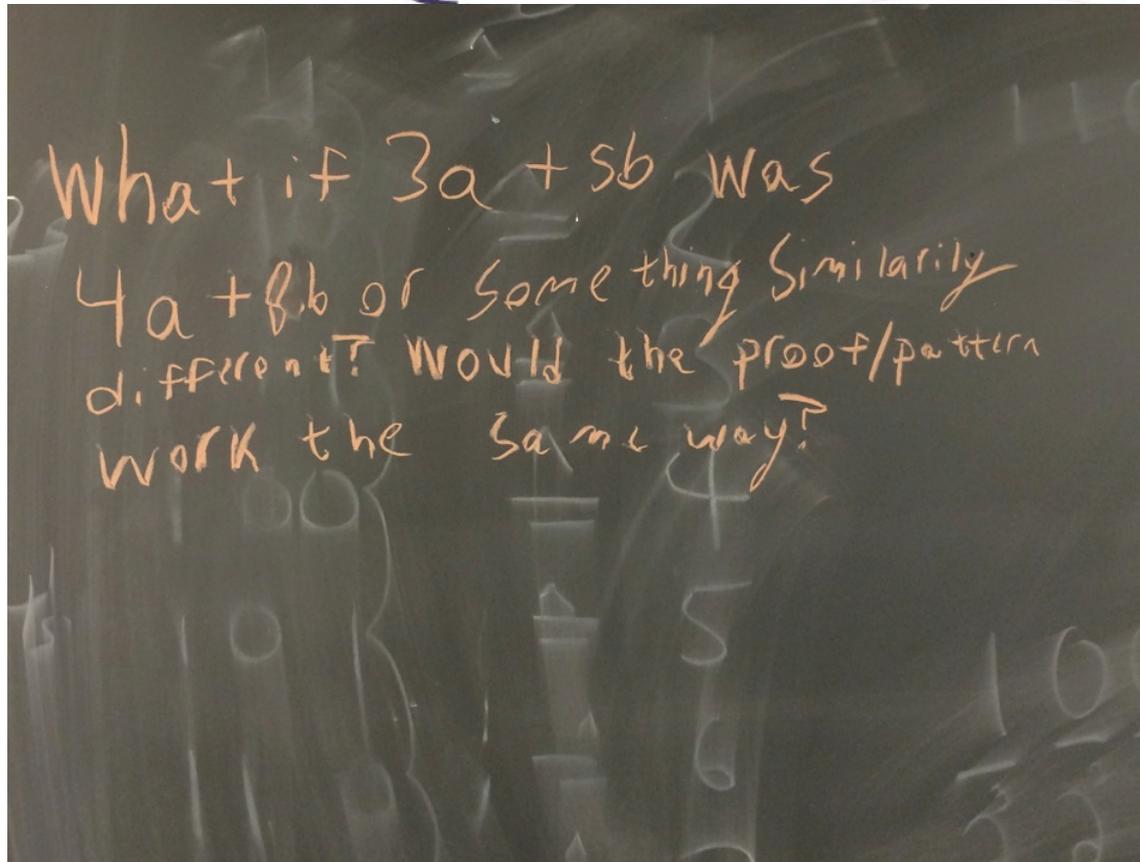


Student questions

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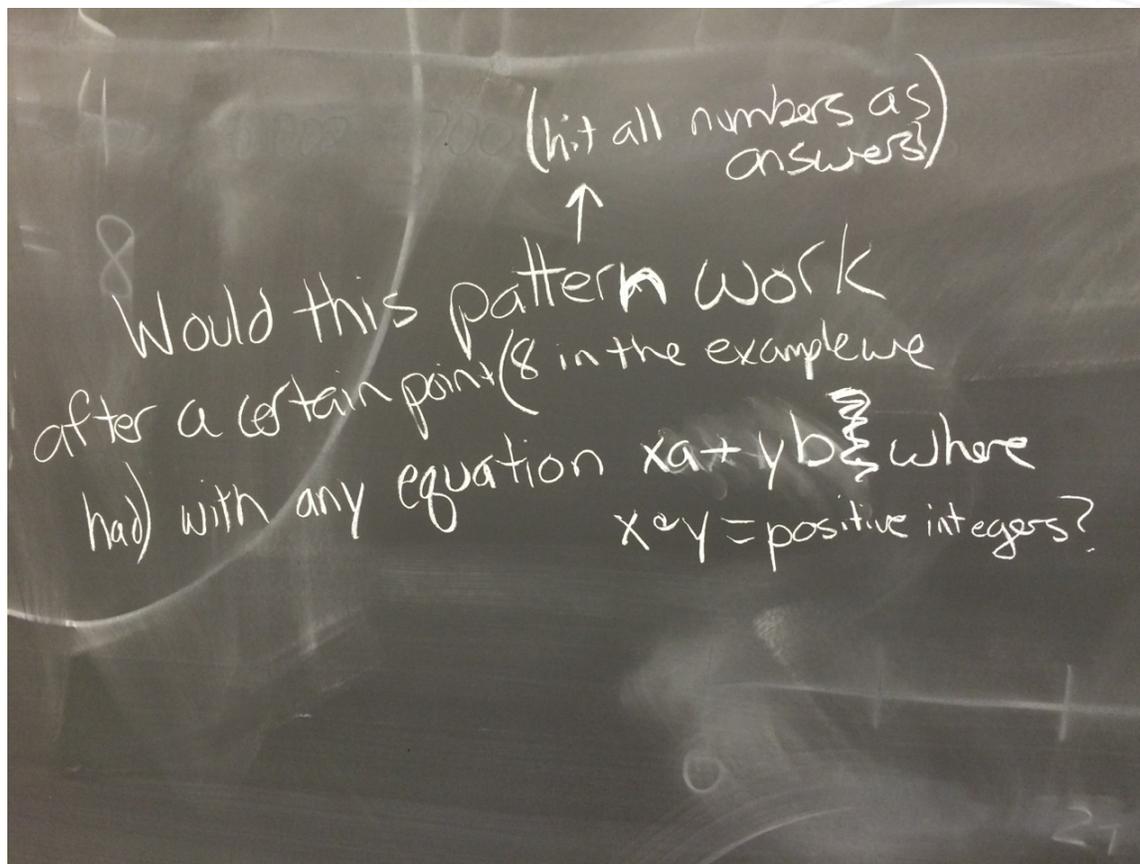


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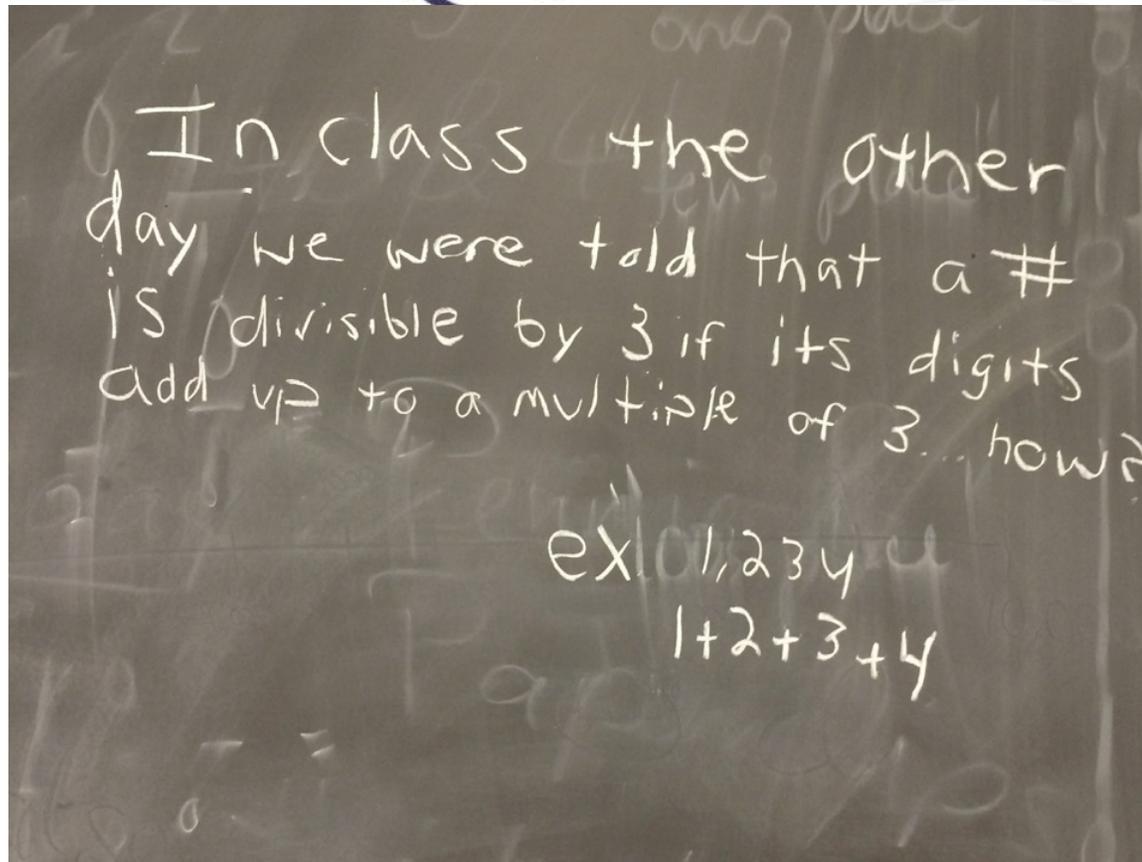
Are there any equations that allow you to find any numbers? Or because $3a+5b$ doesn't allow you to find four numbers $(1, 2, 4, 7)$, are there any that can find all but 3 or 2 or 1?

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What DAoM can offer

- FREE curriculum materials (11 books) for IBL in Math for Liberal Arts -- download from artofmathematics.org/books
- “Discovering the Art of Teaching”: Rich collection of pedagogical tools (and reflections) online
- NSF supported Traveling Workshops (10+ faculty at your institution)

Summary

A Culture of Open Questions

- IBL = Do in class what you want your students to be able to do down the road.
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- Learn about support for your own IBL practice

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Thank you!

Visit us at Booth #537 in the Exhibit Hall!

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Volker Ecke & DAoM Team

Westfield State University

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