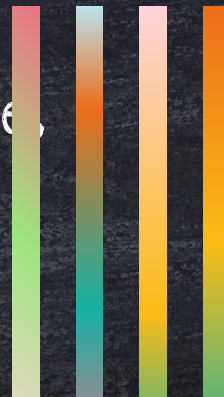




Khan Academy

Instructional Mathematics  
Videos  
In ASL

Samantha Braid, Nick Catalano, Chris Flygare,  
Nancy McAnlis, and Keith Mousley



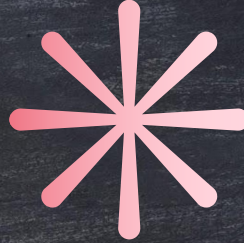




# Our Presenters



Samantha Braid



Nick Catalano





# Our Presenters



Chris Flygare



Nancy McAnlis



Keith Mousley





# Agenda



01

Essentials of ASL  
in math

02

Khan Academy  
Project

03

Guidelines


04

Rubric Evaluation

05

Publishing ASL texts






"Successful mathematics problem solving for deaf students also involves integration of three languages: American Sign Language (ASL), English, and the 'language of mathematics' (the different meanings of words when used for mathematics)."



- H. A. Rowley (2001)



The background is a dark, textured chalkboard. At the top center is a large orange circle. A horizontal pink bar with a white segment on the left is at the top. To the left of the bar is a teal zigzag line. On the right is a large, multi-colored (pink, teal, orange) organic shape with a grid of small pink dots. In the bottom left, there is a dashed white arrow pointing down and an orange curved arrow. In the bottom right, there are three overlapping white circles.

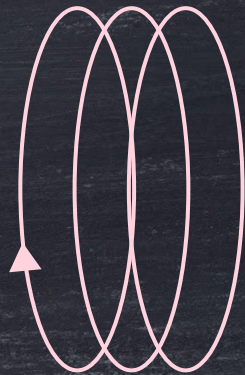
# Gateway to Academic ASL





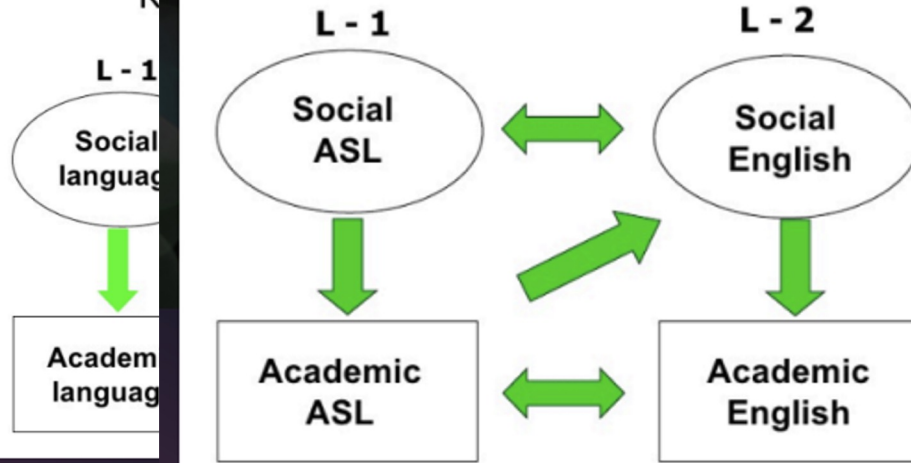
01

# Essentials of ASL in Math



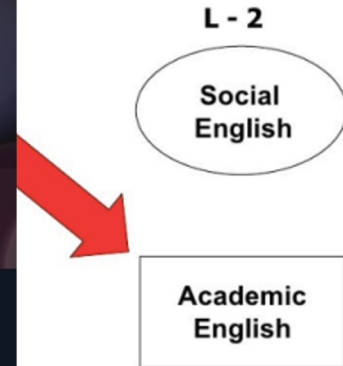
# ASL/ENGLISH BILINGUAL GROWTH

Bilingual Approach to Language Development  
for Deaf and HOH Children




# ENGLISH BILINGUAL GROWTH

Language Development for  
Hearing (HOH) Children







# Who is part of the team?

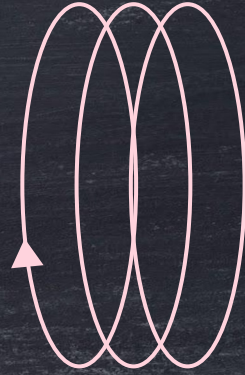
4+ years of planning  
Recruiting  
Working sessions





02

# Khan Academy Project





# Khan Academy Project



**Funded by NSF**

National Science Foundation



**Team**

Numerous members  
involved in the process



**Videos**

Steps required





Region	Name	Occupation
RIT/NTID	Gary Blatto-Vallee Chris Kurz  Donna Lange Keith Mousley	Senior Lecturer Professor, MS in Secondary Education Program Associate Professor Associate Professor & DeafTec Co-Chair
California School for the Deaf, Fremont	Samantha Braid	Secondary Mathematics Teacher
Colorado School for the Deaf and Blind	Nick Catalano	Secondary Mathematics Teacher
Rocky Mountain Deaf School	Nancy McAnlis	Secondary Mathematics Teacher
Texas School for the Deaf	Carl Borsotti	Secondary Mathematics Teacher
Utah Schools for the Deaf and Blind	Chris Flygare	Secondary Math Online Teacher



# Khan Academy Project

## ALGEBRA BASICS

### 1) NEGATIVE NUMBERS

Number opposites  
 Adding numbers with different signs  
 Adding & subtracting negative numbers  
 Subtracting a negative = adding a positive  
 Multiplying positive & negative numbers  
 Why a negative times a negative is a positive  
 Why a negative times a negative makes sense  
 Dividing positive and negative numbers

### 2) ABSOLUTE VALUE

Absolute value examples  
 Absolute value and number lines  
 Interpreting absolute value

### 3) EXPONENTS

Intro to exponents  
 Exponent example 1  
 Exponent example 2  
 The 0 & 1st power  
 Powers of zero  
 1 and -1 to different powers  
 Comparing exponent expressions  
 Exponents of decimals  
 Evaluating exponent expression with variables

### 4) SQUARE ROOTS

Intro to square roots  
 Simplifying square roots  
 Simplifying square roots of fractions  
 Simplifying square-root expressions: no variables  
 Simplifying square roots (variables)

### 5) ORDER OF OPERATIONS

Intro to order of operations  
 Order of operations examples: exponents  
 Worked example: Order of operations (PEMDAS)  
 Order of operations examples



Khan Academy



KhanAcademyAmericanSignLanguage

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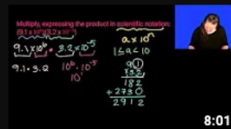
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8:01

Multiplying in scientific notation example

7 views • 3 weeks ago



14:08

Introduction to Grouping

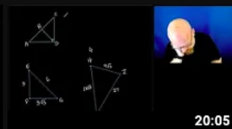
6 views • 3 weeks ago



8:35

Factoring higher degree polynomials: Common Factor

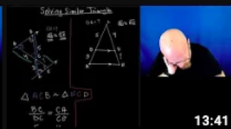
6 views • 1 month ago



20:05

Determining Similar Triangles

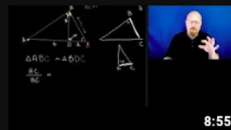
2 views • 1 month ago



13:41

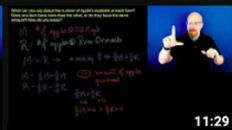
Solving similar triangles

3 views • 1 month ago



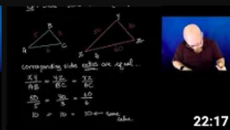
8:55

Order of operations examples



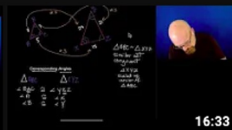
11:29

Order of operations examples



22:17

Order of operations examples



16:33

Order of operations examples



21:23

Order of operations examples



# Khan Academy Project

ALGEBRA BASICS
1) NEGATIVE NUMBERS
Number opposites
Adding numbers with different signs
Adding & subtracting negative numbers
Subtracting a negative = adding a positive
Multiplying positive & negative numbers
Why a negative times a negative is a positive
Why a negative times a negative makes sense
Dividing positive and negative numbers

- 
- 
- 
- 



Opposite of a number


**Opposite of  
a number**



 Khan Academy

**Adding numbers  
with different signs  
example**



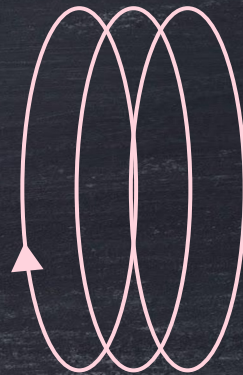
 Khan Academy





# Guidelines

Translating and Creating Videos







# Math Content.

## Presentation Delivery

## Video Structure

## Sign Language

...







# Evaluation Process

Two members evaluating

Coordinator

Publish Videos

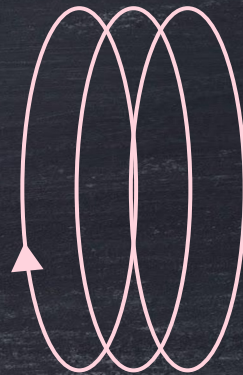
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04

# Rubric Evaluations





# Rubric Evaluations

## Khan Academy Video Rubric

Evaluator: \_\_\_\_\_

Instructor: \_\_\_\_\_

Topic: \_\_\_\_\_

KEY POINTS	APPROVAL		FEEDBACK & SUGGESTIONS
MATH CONTENT			
Focused on the goal	YES	NO	
Appropriate level of tutoring	YES	NO	
Simple & straightforward	YES	NO	
Factual accuracy	YES	NO	
Include details (key concepts emphasized)	YES	NO	
PRESENTATION DELIVERY			
Appropriate pace & pause	YES	NO	
Summary & wrap-up	YES	NO	
Pleasant & nice	YES	NO	
Images, diagrams & writings	YES	NO	
Ask leading question(s)	YES	NO	
Respect the learner	YES	NO	
Style consistency (Clothes & no logos)	YES	NO	
VIDEO STRUCTURE			
Video quality	YES	NO	
Mobile compatible	YES	NO	
Camera setting	YES	NO	
Spatial arrangement (size & colors)	YES	NO	
SIGN LANGUAGE			
Clear signing (including mobile compatible)	YES	NO	
Signing space	YES	NO	
Interactive & eye contact	YES	NO	
Signing conceptually correct & consistent	YES	NO	
Attire & background color contrast	YES	NO	

Recommended: YES or NO

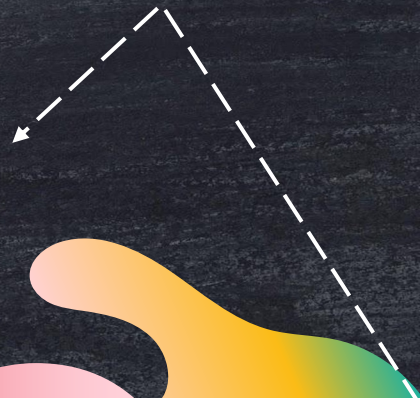
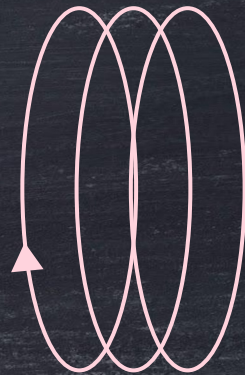
Overall feedback & suggestions:





05

# Publishing ASL math texts





$$4x^a + 25x^b - 21x^c$$



Multiply, expressing the product in scientific notation:

$$(9.1 \times 10^6)(3.2 \times 10^{-5})$$

$$9.1 \times 10^6 \cdot 3.2 \times 10^{-5}$$

$$9.1 \cdot 3.2 \quad 10^6 \cdot 10^{-5}$$

$$10^1$$

$$a \times 10^n$$

$$1 \leq a < 10$$

$$\begin{array}{r} 9.1 \\ \times 3.2 \\ \hline 182 \\ + 2730 \\ \hline 2912 \end{array}$$



Multiply  $(3x + 2)(5x - 7)$

First  
Outside  
Inside  
Last

$$(3x \cdot 5x) + (3x \cdot -7) + (2 \cdot 5x) + (2 \cdot -7)$$

$$15x^2 - 21x + 10x - 14$$

$$15x^2 - 11x - 14$$



Moussa and Fatu were asked to factor the quadratic expression  $16x^2 - 64$ .

Which student wrote an equivalent expression?

Difference of Squares

$$a^2 - b^2 = (a + b)(a - b)$$

Moussa	Fatu
$16(x + 2)(x - 2)$	$(4x + 8)(4x - 8)$

$$16x^2 - 64$$

$$16(x^2 - 4)$$

$$\begin{array}{c} \downarrow \quad \downarrow \\ a=x \quad b=2 \\ 16(a+2)(a-2) \end{array}$$



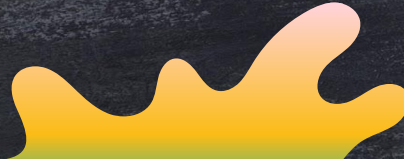


# Math ASL reSources


Atomic Hands

STEM Dictionary

ASL CORE







197

MATH ASL VIDEOS!






# Timeline

**2019**

**2020-2022**

**2022-2024**



Trial and  
Error

Publishing

We need  
YOU!







# Thanks!

Do you have any questions?

Keith Mousley: [kxmntm@rit.edu](mailto:kxmntm@rit.edu)

Chris Kurz: [caknsp@rit.edu](mailto:caknsp@rit.edu)

[YouTube: Khan Academy](#)



[www.deaftec.org](http://www.deaftec.org)