

## Constructing Understanding of Mathematics



RNeufeld - Author



### SNACK on Fractions of Licorice and JuJubes to VISUALIZE 'n LEARN Fraction Operations.

EMPOWER LEARNERS by "tasting" related 3 part lessons to construct learning in a sequence of topics - **Introduction** to **Equivalent** to **Adding** to **Multiplying Fractions**. This rich learning environment offers on and off computer activities including real and virtual manipulatives. Participants receive access to online lessons for their classes. (Gr 2 to 6)



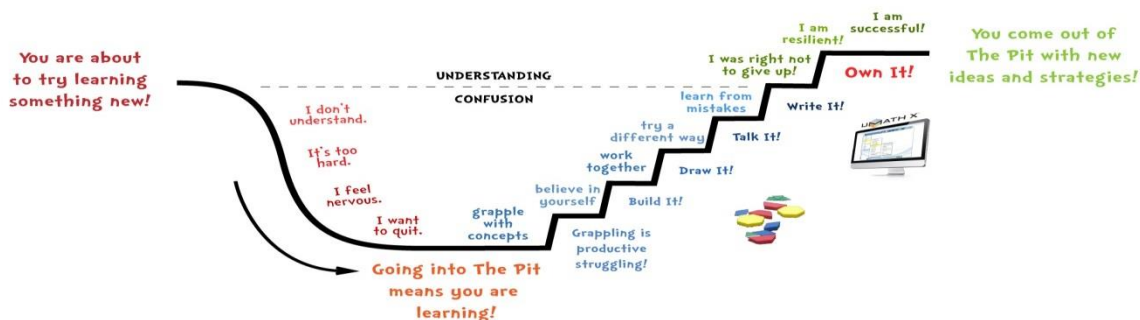
JHastings - OH

### The Learning Environment

- Click the link: [EmpoweringStudentsToConstructTheirLearning](http://www.empoweringstudents.com)
- Play the video: <http://www.jamesnottingham.co.uk/learning-pit>

#### The Learning Pit

A Model for a Growth Mindset



RMeekins - NY

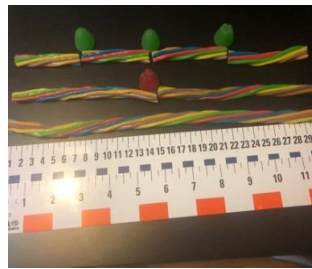


LLink - MI

#### Needs:

The screenshot shows the UMathX interface with three main menu areas:

- Content Menu:** Includes options like "Launch a Lesson", "Search UMathX", "Analyze Data", "Do a Test", "View a Framework", "Manage Bookmarks", and "Help Me Get Started".
- Curriculum Menu:** Includes "Content Menu", "Common Core", "Open Up Resources", "Topic Tools", "Florida Standards", and "Virginia SOLs".
- Special Tools Menu:** Points to a section of the interface.



AGolem - OH

???

- Play the video: [UMathX.What is it? video](#)
- Enter the URL [www.umathx.com/preview](http://www.umathx.com/preview) into the address box of any browser. Enter the Username **that you have been given for this UMathX session**. Enter the Generic Password: **umath**

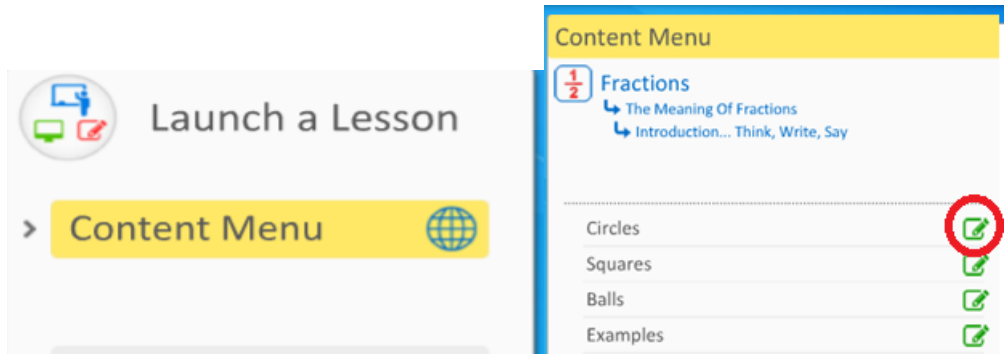
LSellers or ?? of

G Brown ES - AL

# Concept 1: The Meaning of Fractions:

On Computer ... Content Menu ... Fractions>Meaning>Introduction>Circles;

On Computer ... Content Menu ... Fractions>Meaning>Pattern Blocks (names of shapes)



## ON Paper:

Select and print the Framework: Fraction Introduction: (see below)

## With Pattern Blocks:

### Framework for Learning:

Leader's Name: .....

Co-Leader's Name: .....

### Fraction Introduction Pattern Blocks – 1

Instructor's Initials: .....

### Getting Started:

In **UMath X** follow the path in the Content Menu:

Fractions > The Meaning of Fractions > Introduction – Think, Write, Say

Select and work through the Sub Lessons: Circles> Squares> Balls> Examples

Now talk about the main ideas in the above sub lessons.

Then write down the main ideas below:



Now return to **UMath X** and follow the path in the Content Menu:  
Fractions > The Meaning of Fractions > Pattern Blocks

Select and work through 4 of 5 of the Sub Lessons:

Example 1> Example 2> Example 3> Example 4  
Put your computer aside when you get to Example 5.



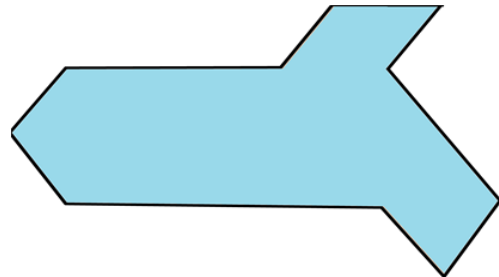
Talk about the main ideas in the above sub lessons.

Write down the main ideas below.

### Working At It:

Work away from the computer.

Use pattern blocks to cover the shape below with only yellow, red and blue pattern blocks. (not green)



The largest face of the yellow pattern block is called a \_\_\_\_\_.

The largest face of the red pattern block is called a \_\_\_\_\_.

The largest face of the blue pattern block is called a \_\_\_\_\_.

What fraction of the design is yellow? \_\_\_\_\_

What fraction of the design is red? \_\_\_\_\_

What fraction of the design is blue? \_\_\_\_\_

Now leave the yellow, blue and red blocks in place but cover all block with green blocks.

Now name each of the fractions above in another way. (We are dealing with equivalent fractions)

### Reflect and Connect:

Now return to a computer and login into **UMath X** and navigate to the Content Menu:  
Fractions> The Meaning of Fractions > Pattern Blocks> Example 5

Work through Example 5 to check your work in the WORKING AT IT section above.

Talk, and then write about fractions with different names.

Now design a question for your group.

Build It. Draw It. Talk It. Write It. Now you OWN It!



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On Computer ... Content Menu – Fractions>Meaning>Fraction of a Set>Example 1: Marbles

On Framework ... “Fraction of a Set”

JuJubes ... Handout a set of JuJubes with variety of colors.

Show me five sevenths; six sevenths; seven sevenths (must we have equal numbers?)



On Computer ... Content Menu - The Meaning of Fractions> Fraction Strips (concepts 1 - 4)

On Framework ... “Fraction Strips – Concept 1

Licorice ... how do I make 1/2 ... 1/4 ... .. but what about 1/3???

# Concept 2: Equivalent Fractions

On Computer ..Content Menu.. Fractions> Equivalent Fractions > Pattern Blocks>Hexagon1  
 On Paper ..Framework.. Equivalent Fractions (tiers)



## Framework for Learning: Equivalent Fractions – 1

Leader Name: .....  
 Co-Leader's Name: ..... Instructor's Initials: .....



### Getting Started:

In UMATH X follow the Content Menu path:  
 Fractions > Equivalent Fractions > Introduction  
 As you work through the lessons Square and Triangle, complete the corresponding models and notes below.

**Square**

Conclusion:  $\frac{\square}{\square}$  and  $\frac{\square}{\square}$  are \_\_\_\_\_ fractions.

**Triangle**

Conclusion:  $\frac{\square}{\square}$  and  $\frac{\square}{\square}$  are \_\_\_\_\_ fractions.

### Working In It: Complete the models and statements for each of the following.

Color one section of this model red.

$\frac{\square}{\square}$  of the hexagon is shaded red.

Color sections of this model green to create an equivalent fraction.

$\frac{\square}{\square}$  of the hexagon is shaded green.

Circle the correct answer to complete the comparisons.

The sizes of the two figures are: a) the same b) different.

The shapes of the figures are: a) the same b) different.

The colored portions of the shapes are: a) the same b) different.

Conclusion:  $\frac{\square}{\square}$  and  $\frac{\square}{\square}$  are \_\_\_\_\_ fractions.

Color one section of this model red.



$\frac{\square}{\square}$  of the hexagon is shaded red.

Color sections of this model green to create an equivalent fraction.



$\frac{\square}{\square}$  of the hexagon is shaded green.

Circle the correct answer to complete the comparisons.

The sizes of the two figures are: a) the same b) different.

The shapes of the figures are: a) the same b) different.

The colored portions of the shapes are: a) the same b) different.

Conclusion:  $\frac{\square}{\square}$  and  $\frac{\square}{\square}$  are \_\_\_\_\_ fractions.

In UMATH X follow the Content Menu path:  
 Fractions > Equivalent Fractions > Pattern Blocks > Hexagon 1 and Hexagon 2  
 Compare your answers above with those in the lessons.  
 Correct any mistakes.

### Reflect & Connect:

Study and compare each pair of shapes carefully.  
 Think about the following questions:  
 Do the shaded regions of each pair of shapes represent equivalent fractions? Why or why not?

Pair 1: Pair 2: Pair 3:

Discuss your observations and thoughts with a partner.  
 Write a short paragraph on a separate sheet of paper summarizing your discussion.

Build it. Draw it. Talk it. Write it. Now you OWN it!

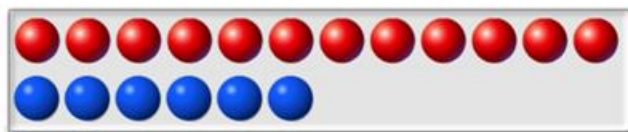


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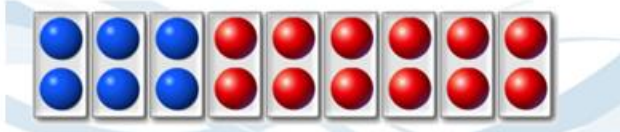
On Computer ..Content Menu.. Fractions> Equivalent Fractions > Fraction Strips With Licorice ..

On Computer .. Content Menu.. Fractions>Equivalent Fractions>An Explanation with Sets With Jujubes ..

18 marbles represent One Whole.  
 12 marbles are red.  
 6 marbles are blue.  $\frac{12}{18}$  is the fraction of marbles that are red.



6 sets are red.  
 3 sets are blue.  $\frac{6}{9}$  is the fraction of SETS of marbles that are red.



$\frac{12}{18}$



$\frac{6}{9}$



$\frac{4}{6}$

Challenge .. use your marbles or jujubes to go to the next step

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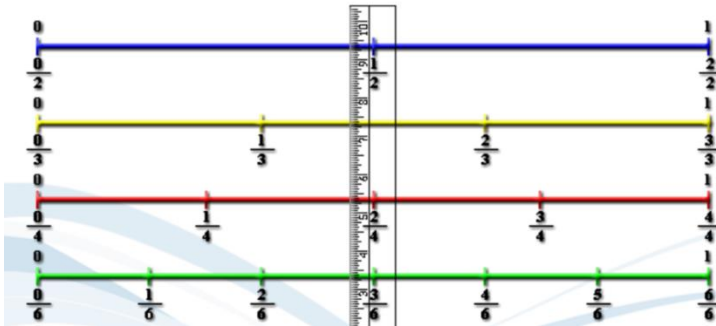
## JuJubes ... activity

On Computer ..Content Menu.. Fractions>Equivalent Fractions>Equi Fractions on # Line

On Paper ..Framework.. Equivalent Fractions on # Line

Look along the ruler to find equivalent fractions

$$\frac{1}{2} = \frac{\quad}{\quad}$$



Licorice ... activity

## Concept 3: Adding Fractions:

On Computer ..Content Menu.. Fractions> Adding Fractions > Pattern Blocks>Hexagon 2

$$\frac{1}{6} + \frac{4}{6} = \frac{5}{6}$$

1 sixth of a hexagon plus 2 thirds of a hexagon

$\frac{5}{6}$  of 6 equal parts are green or blue.  
 $\frac{5}{6}$  of the hexagon is green or blue.

On Computer & Paper ..Content Menu.. Fractions> Adding Fractions > Word Problems>

**UMATH X**  
**Framework for Learning: Adding Fractions – Word Problems with Unlike Denominators - 1**

Leaders Name: \_\_\_\_\_ Instructor's Initials: \_\_\_\_\_  
 Co-Leaders Name: \_\_\_\_\_

**Getting Started:**

**Example 1**  
The lowest common denominator of  $\frac{1}{3}$  and  $\frac{1}{4}$  is \_\_\_\_\_

$$\frac{1}{3} \times \frac{\square}{\square} = \frac{\square}{\square}$$

$$\frac{1}{4} \times \frac{\square}{\square} = \frac{\square}{\square}$$

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

**Example 2**  
The lowest common denominator of  $\frac{2}{5}$  and  $\frac{5}{7}$  is \_\_\_\_\_

$$\frac{2}{5} \times \frac{\square}{\square} = \frac{\square}{\square}$$

$$\frac{5}{7} \times \frac{\square}{\square} = \frac{\square}{\square}$$

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

**Working In It:**  
 Log Into **UMathX**.  
 From the Content Menu, follow the path below:  
 As you work through each lesson, complete the corresponding notes and models on paper below.  
 Fractions > Adding Fractions > Word Problems > Eating Candy > Goal Scoring > Taking a Walk

**Eating Candy**  
 Elliot and Cathy got some candy from their grandmother. Elliot ate one quarter of the candy, and his sister ate one third. How much candy did the two eat?

**Original Problem with Unlike Denominators:**

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

**Problem with Like Denominators:**

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

**Goal Scoring**  
 Tyler and Garrett play hockey. Tyler scored one sixth of the team's goals. Garrett scored one eighth of the team's goals. What fraction of the team's goals did the two players score?

**Original Problem with Unlike Denominators:**

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

**Problem with Like Denominators:**

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

**Taking a Walk**  
 Nadia and Kate were walking. Nadia walked one sixth of a kilometer. Kate walked one half of a kilometer. What was the total distance walked by both of them?

**Original Problem with Unlike Denominators:**

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

**Problem with Like Denominators:**

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

**Reflect & Connect:** Complete the following on a separate sheet of paper.  
 Discuss the process of adding fractions with unlike denominators with a partner. Write a short paragraph summarizing the steps.  
 Write two word problems involving adding fractions with unlike denominators for your partner to solve. Require your partner to include the following for each problem: 1) an addition sentence; and 2) a model.  
 When both of you have finished solving each other's problems, exchange papers. Discuss and correct any mistakes before turning in your work to your teacher.

Build it. Draw it. Talk it. Write it. Now you OWN it!  
  
 www.UMathX.com

## Concept 4: Multiplying Fractions:

### Pattern Blocks .. on Computer .. virtual and real manipulatives

Log into UMathX  
In the Content Menu:  
Follow the path .. Fractions>  
Multiplying Fractions > Pattern Blocks

As you work through each Hexagon:  
First ... use real pattern blocks to reproduce the graphics on the computer screen.



Then Complete the notes below:  
We are left with:  
 $1/2$  of  $1/3$  =



We are left with:  
 $1/2$  of  $1/2$  =



We are left with:  
 $1/4$  of  $1/3$  =

### Interpretation on Computer and on Paper ...Build it ..Draw it ..Talk it .. to OWN IT

In UMathX, follow the Content Menu:  
Fractions > Multiplying Fraction > Developing the Rule  
Select and complete the Sub Lesson: Example 3 - Proper Fraction x Proper Fraction  
As you work through the lesson, use 2 colored pencils to record graphics of Example 3 in the box below.

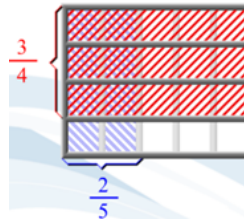
My diagram represents the multiplication of \_\_\_\_\_ and \_\_\_\_\_ = \_\_\_\_\_



The part colored \_\_\_\_\_ represents the answer.

We want to multiply  $\frac{3}{4} \times \frac{2}{5}$

This means that we want  $\frac{3}{4}$  of  $\frac{2}{5}$  of a group.



This is 1 shape...  
- break it into 5 equal parts  
- take 2 of the 5 equal parts  
- now break it into 4 equal parts  
- take 3 of the 4 equal parts

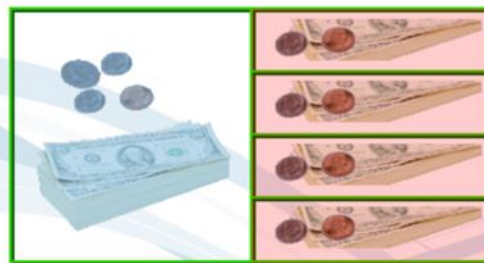
### On Paper and Computer and Licorice

Boris went to the store with half of his allowance.  
He spent three quarters of the money that he brought along.  
How much of his total allowance did he spend?

He spent \_\_\_\_\_ of \_\_\_\_\_ of his total allowance

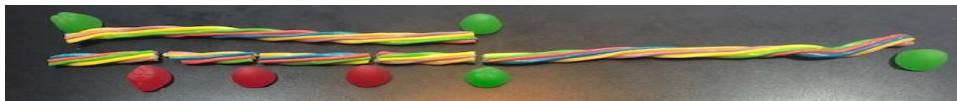


This rectangle represents all of Boris' allowance.



Total Allowance

Now, click on  $\frac{3}{4}$  of the money that he took to the store, to represent the money that he spent.



### Make Up Two Word Problems to match the diagrams.

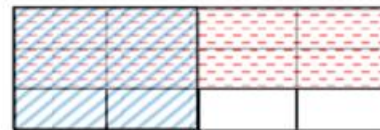
The multiplication is \_\_\_\_\_ X \_\_\_\_\_

The answer is \_\_\_\_\_



The multiplication is \_\_\_\_\_ X \_\_\_\_\_

The answer is \_\_\_\_\_



**Build It. Draw It. Talk It. Write It. Now you OWN IT!!**

**Video Ma and Pa Kettle .. "Construct Understanding"**