Math Vocabulary
array model
area model
factors
products
multiples
prime factors
greatest common factor
least common multiple

ELPS (*English Language Proficiency Standards*)
2A, 2F, 2I, 3C, 3E, 3H, 4C, 5D, 5F, 5G

CCRS *(College and Career Readiness Standards)*
I – BC
IV – C1
VIII – A1, S2, A3, A4, A5, B1, B2, C1, C2, C3
IX – A1, A2, A3, B1, B2, C1, C2, C3
X – B1

Transition to Math

Let's take a look at our Measurement Lab assignment for today. There were two strategies for you to use to solve those problems: one was to think in terms of area; the other was to use an array. And of course, we had the key to determine the final answer.

But for now, let's just look at the grid picture. How did you solve this problem? *(Responses – could be they counted the squares showing underneath the shaded area; or that they used multiplication.)*

Without thinking about the key, what is the area of the rectangle superimposed over the grid? (*48 square units – be sure they say square units)* Yes, they are SQUARE UNITS. We measure areas in those little squares, and the unit of measure is a square unit. In the case of the problem you solved, we solve for SQUARE MILES. What does that mean? *(Square Mile is a square that is one mile long and one mile wide—like a tile of the floor only MILE long in every direction rather than just a foot.)*

But let's go back to thinking about the visual measurement of that shaded rectangle. You said 48 square units. Some of you probably counted the squares, which is a valid way of finding the area for this problem. Some of you multiplied. What did you multiply? *(response)* We multiplied 8 x 6. And we found those numbers by counting the SIDES of the squares. (*Point to the rectangle's 8 unit side*.) There are 8 units that make up this side. This is a straight line measurement. This number, 8, is one of the FACTORS that we use to find the PRODUCT of 48. (*Write on a board or chart paper.)*

There is only one other number that you can use to multiply 8 by to get 48. What is it? *(six)* Look at the area model. The other side of the model is SIX units long *(count them)*. SIX is the other FACTOR. *(Write on a board or chart paper.)*

And 48 is the PRODUCT of 8 and 6. 48 is also A MULTIPLE of 8, and A MULTIPLE of 6. Are there other multiples of 8? *(response)* Sure, any number that you say when you skip count by 8 is a multiple of 8 – 8 then is one of the FACTORS of the multiple. (*Write the multiples of 8 through ten times, or 80.)*

And what about 6 – are there other MULTIPLES of six? Of course, any number that you say when you skip count by SIX is a multiple of 6. *(Write the multiples of 6 through 10 times or 60.)*

Let's try a few more area model multiplication before our TV Lesson.

Unit 2, Lesson 1 — Grades 5-6
Transition to Math - continued

(Work through the BLM-TM Factors, Products, Multiples with the students using this process:

1. **Make the rectangle described on grid paper,** *always using the first dimension as the width and the second dimension as the length – we are developing an understanding of matrix, which is a definite location of the rectangle, and is always noted as rows times columns.*
2. **Label the side measures, find the area, then write the number sentence which describes this particular dimension/area relationship (example 2 x 9 = 18).**
3. **Develop the number sentence on the table at the bottom** *using factor (width) times factors (length) to find the product (area).*
4. **Find multiples of the first factor** *beginning with the factor and ending with 10 times the factor. A hundreds chart is provided if students have a difficult time skip counting by some of the factors. Simply have students find the factor and color with a light colored crayon, then add the factor and color that multiple and so forth until they have colored in 10 multiples.*

(Complete these three columns before the TV Lesson.)

QUESTIONS *are to the left.*

Objectives

Read through the math and language objectives, making sure that students understand how they accomplished each.

QUESTIONS:

Step 1

- Name the rectangle we've drawn *(first example is a 2 units by 9 units rectangle).*

Step 2

- What are the side measurements *(start with width, or rows; then length, or number of columns)*?
- What number sentence describes the relationship of the measures of these sides to the area?

Step 3 – *refer to the bottom table*

- If we think of these as factors and a product, what is our number sentence that represents that relationship? *(Same as the one inside the rectangle.)*

Step 4

- If we skip count by our first factor (*width*) what are the multiples of that factor beginning with the factor itself and skip counting through 10 times that factor *(first multiple which is the first factor)*?
- If we skip count by our second factor, what are the multiples of that factor beginning with the factor itself and skip counting through 10 times that factor?

💻 **Technology**:

Factors and Multiples

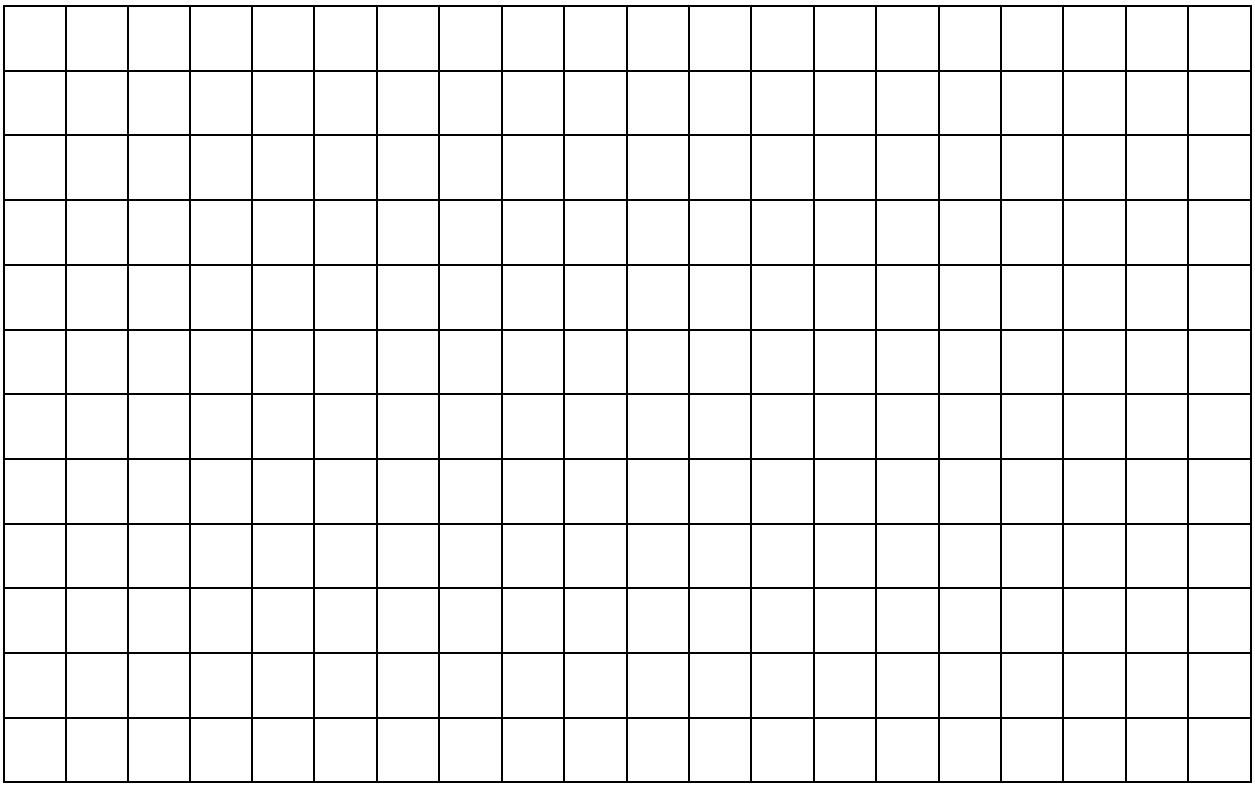
http://www.bbc.co.uk/bitesize/ks2/maths/number/factors_multiples/play/ Very British! Make sure your class can handle the British, then practice "throwing" the multiples in the second activity before working with the students.

http://interactivemaths.net/index.php?q=category/1/28/29/106 An entire page of links for many factor/multiple practice games/activities.

Unit 2 Lesson 1 – Transition to Math
One per student

Factors – Products – Multiples

1cm Graph Paper



Dimensions	Factor x Factor = Product	Other Multiples of the First Factor (through 10 times)	Other Multiples of the Second Factor (through 10 times)	Least Common Multiple or LCM
2cm by 9cm		2,	9,	
3cm by 8cm		3,	8,	
4cm by 7cm		4,	7,	
5cm by 6cm		5,	6	

Unit 2 Lesson 1 – Transition to Math
One per student

Hundreds Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Materials

- Two pieces of construction paper, 1" x 9" one each of red and yellow -- one each per student
- Scissors -- one per student
- **BLM TM** – The Crow and the Pitcher – TV Teacher needs one; students should have the one they completed in TM lesson.
- **BLM** – The Crow and the Pitcher Revisited – one per student

Math Vocabulary
unlike denominators
like denominators
unit price
ratio
proportion"
percent
greatest common factor
least common multiple

Literature Vocabulary
moral
trait
patient
impatient
greedy
generous
adventurous
cautious

ELPS (*English Language Proficiency Standards*)
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Unit 4, Lesson 1 — Grades 5-6

TV Lesson

Math Objectives:

- Add and subtract positive rational numbers fluently.

Language Objectives:

- Discuss problem solving strategies with peers.
- Write out solutions for solving problems.
- Justify their thinking and strategies.

Building Background
The crow was very smart. She learned from past experiences and from observation. We're going to use a few of your past experiences today and your observations skills to help us understand adding and subtracting fractions with Unlike denominators.

Let's look back at the BLM you used during your Transition to Math lesson (*Show the **BLM-TM** The Crow and the Pitcher).*

First, observe the pictures of the pitchers. What do you notice about the increments on the pitchers for the two problems? *(pause)* You might have observed several things, but I hope that you noticed that in problem one, both of the pitchers were marked in fourths. In problem two, both of the pitchers were marked in tenths. This is very important.

We cannot add or subtract fractions unless their denominators are the same. Why is that so, do you think? Discuss quickly in your class. *(pause)*

To answer that, let's look at a few models.
Take a look at these pieces of construction paper. What do you observe about these pieces of construction paper? *(pause)*
Yes, there are two different colors.
And they are both the same size strip. Work with me, please.

Comprehensible Input
Now, I'm going to divide these pieces into fractional parts.
The red piece, I'll divide into fourths. (*Do so by folding into half, then folding the half into half, opening to see the four equal pieces, and cutting apart).* Now, I have 1/4 and 1/4 and 1/4 and 1/4. What do you notice about all of the denominators? (*They are the same -- four equal pieces, fourths.)*

I'd like each of you to write two addition sentences and two subtraction sentences using fourths. *(generous pause)*

Here are a few I made: 1/4 + 1/4 = 2/4; 3/4 + 1/4 = 4/4; 3/4 – 1/4 = 2/4; 2/4 – 1/4 = 1/4 .

There are many addition and subtraction sentences with fourths -- but what do they all have in common? (*They are combinations and separations of fourths*.) I know that when I add or subtract, I will end up with fourths because I started out with fourths -- both fractions had fourths in common.

OK, let's take the yellow strip of paper. I'm going to cut that into eighths. (*Do so in the same fashion as you did the fourths, by folding in half each time, then cutting apart*.)

I have eight equal pieces, and I could add and subtract eighths just like I did the fourths. And every time I add or subtract eighths together, I know I'm going to get an answer in eighths because I started out with eighths -- both fractions had eighths in common.

- But what happens if I want to add 1/4 and 1/8? (*Lay down red and yellow piece.*)
- How do I do that?
- What will I end up with?
- What is 1/4 and 1/8? *(Pause for discussion.)*
- Is it as easy to add and subtract as our previous problems?
- What is different from our other examples? *(pause)*

We don't have a common denominator. We can put these two pieces down together, but we don't have a common name to call them.

Ah, but in comes the mathematician to the rescue. The mathematician looks at the pieces, and thinks, "I can find a common denominator and use equivalent fractions so I can add or subtract fourths and eighths."

I'll show you. Please follow along with me with your strips of paper.

If we're going to get these denominators the same, then I have to see a physical relationship between the fourths and the eighths.

See if you can find a relationship. *(Pause for them to work.)*

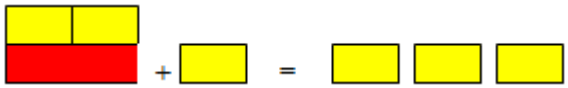
There are many relationships. A simple one to see is that two of my yellow pieces equals one of my red pieces. (*Compare two yellow to one red.)*

How would you describe with a number sentence what we just modeled? *(pause)* 1/8 + 1/8 = 1/4. Check that out with your pieces. Do you agree? *(pause)*

So now I know that 1/4 = 2/8. I have an *equivalent fraction* that I can add to 1/8. What is 2/8 + 1/8? *(pause)* 3/8

Let's prove it again another way.

(*Line up your pieces like this; red + yellow =. Then talk through the exchanging two yellow pieces for the red, and show that all equals three yellows.)*



We can't add or subtract fractions unless we are talking about the same sized pieces. Thank goodness there are ways to find equivalent fractions.

You remember we were finding equivalent ratios; well, we'll find equivalent fractions the same way.

Let's take our $\frac{1}{4}$ $\frac{1}{8}$

We've talked about finding the LCM, the Least Common Multiple. That's the smallest number that both denominators act as a factor for. Look at our two fractions. What do you think the LCM is? *(pause)*

Sure, it's 8. Both 4 and 8 are factors of 8. This one is easy because one of the fractions is already eighths.

$$\frac{2 \times 1 = 2}{2 \times 4 = 8}$$

So what factor do we multiply the denominator 4 by to get 8? *(pause)* 2. And if we multiply the denominator, we have to multiply the numerator by the same number. Why? *(pause)* Because we need to multiply by a form of ONE. 2/2 is ONE.

Now we have our equivalent fraction. 1/4 = 2/8. And I can add the 2/8 to the 1/8. *(Do so.)*

Now you are very wise crows who have observed and found patterns and will now use what you have observed and formulated into a strategy to solve problems.

Let's take a look at the **BLM** The Crow and the Pitcher Revisited.

First, what do you observe that is different about these problems than your Transition to Math problems?

- No models
- Unlike denominators
- More problems

And as you read you'll find another difference.

Let's read #1 together. *(Do so.)*

- What is the math movie you see in your mind when you read this problem? *(Crow drinking; water level dropping.)*
- What fractions are involved and what do they stand for? 7/10 and 1/2
- Talk to your elbow partner about possible strategies for solving this problem. *(generous pause)*
- First of all, this is a subtraction problem.
- What do you know?
    - The water level was up to 7/10. *(Write the 7/10.)*
    - The water level ended up at the 1/2 level. *(Write 1/2 as the answer.)*
    - What we don't know is the change the crow made. We don't know how much she drank or took away from the pitcher. That is our variable.

$$\frac{7}{10} - x = \frac{1}{2}$$

- What do you notice about our equation? *(unlike denominators)*
- Let's get those the same. What is the smallest multiple that 10 and 2 have in common, the Least Common Multiple? *(pause) 10*
- The only fraction we have to change is 1/2. If 2 is one factor of ten, what is the other factor? *5*
- 1/2 x 5/5 = 5/10. 5/10 is equivalent to half.

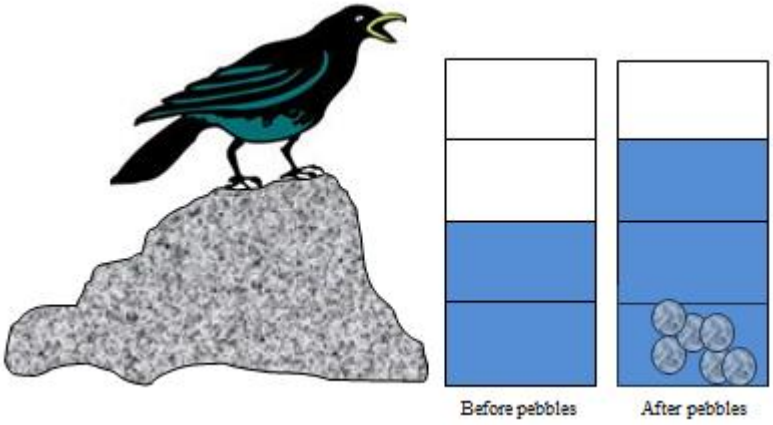
$$\frac{7}{10} - x = \frac{5}{10}$$

	Unit 4, Lesson 1 **Grades 5-6** **TV Lesson** - continued --- So 7/10 subtract some tenth is 5/10. Can you look at that and tell what *x* is? Talk about it in class. Justify your answers. *(pause)* I know that fractions are just like whole numbers. There are fact families to help me reason out an answer. 7 subtract 2 is 5. So, 7- tenths (*Use the word "tenths" as a label on the Smart board)* subtract 2-tenths = 5-tenths. What does 2/10 represent? *(pause)* 2/10 solve the problem of finding the fraction that describes the water the crow drank. OK, now it is your turn. In your Follow-up Lesson, you and your partner will solve the other problems on the BLM. Talk about your strategies in class. **Pirate's Corner** What are some of the math skills you have learned so far this summer that you either didn't know before or that you were not comfortable with before? **Objectives** Read through the math and language objectives, making sure that students understand how they accomplished each.

Unit 4 Lesson 1 – Transition to Math
One per group

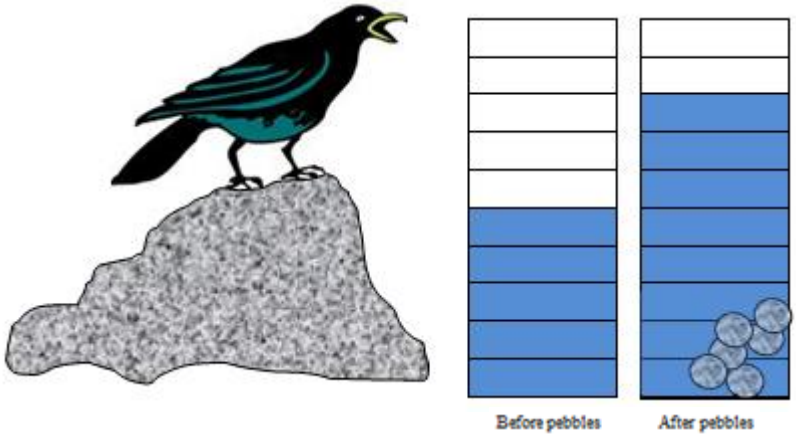
The Crow and the Pitcher

The thirsty crow dropped pebbles into the pitcher and raised the water level so she could drink. This pitcher is divided into fourths, marking the distance to the top of the pitcher in equal increments. The amount of water in the pitcher remained the same, but the level of the water rose.



Write a fraction number sentence that describes what happened in this story.

This pitcher is divided into _____, marking the distance from the bottom of the pitcher to the top of the pitcher.

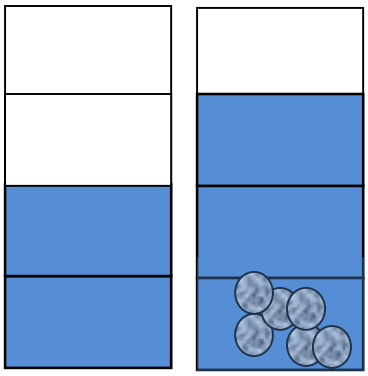


Write a fraction number sentence that describes this story.

Write a decimal number sentence that describes this story.

BLM-TM Unit 4, Lesson 1 **The Crow and the Pitcher**

One per group



Before pebbles After pebbles

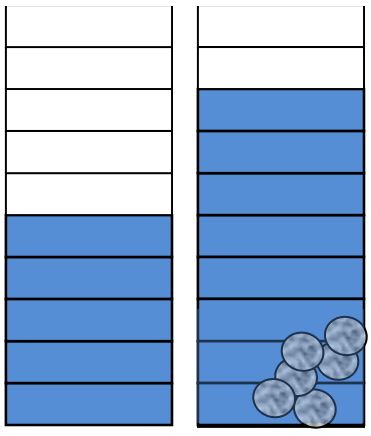
:

El cuervo sediento dejó caer piedras en el jarro y elevó el nivel del agua para poder beber.

Este jarro se divide en cuartos, y aumenta su nivel de agua hasta el tope del jarro en incrementos iguales. La cantidad de agua en el jarro se mantuvo igual, pero el nivel del agua subió.

Escribe una frase con número en fracción que describa lo que sucedió en esta historia:

Before pebbles After pebbles



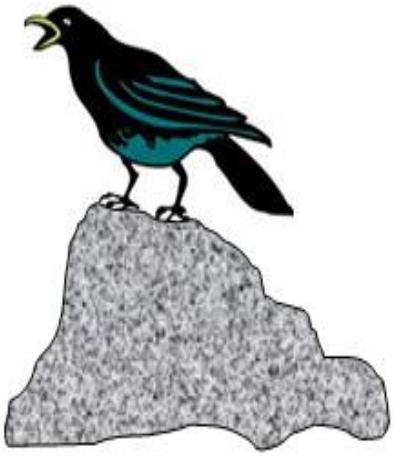
Este jarro se divide en _____, para cubrir la distancia desde el fondo del jarro a la parte superior de este.

Escriba una frase con número en fracción que describa esta historia:

Escriba una frase con número decimal que describa esta historia:

The Crow and the Pitcher Revisited

1. The thirsty crow had brought the water up to the 7/10 mark. She drank and drank, and when she was finished, the water was back to the 1/2 mark. Find the fraction that describes the water the crow drank.



2. The thirsty crow found a pitcher with only 3/8 cup of water in it. After dropping in pebbles, the water rose to the 3/4 cup level. Find the fraction that describes the fractional parts the pebbles caused the water to rise. (HINT: Draw a picture to help you see the math movie!)

3. A kind human saw the crow struggling. The human poured the 5/12 cup of water that was in the pitcher into a flat birdbath. Then the human added another 1/2 cup of water to the birdbath. How much water did crow have now in the birdbath?

The Crow and the Pitcher Revisited

1. El cuervo sediento dejó el nivel de agua en la marca de 7/10. Bebió y bebió, y cuando terminó, el agua volvió a la marca de 1/2. Encuentra la fracción que describe el agua que bebió el cuervo.

2. El cuervo sediento encontró un jarro con solo 3/8 de taza de agua en él. Después de dejar caer piedras, el agua subió al nivel de 3/4 de taza. Encuentra la fracción que describe la fracción de piedras que hizo que el nivel del agua subiera. (SUGERENCIA: ¡Dibuja una imagen para ayudarte a visualizar la historia matemática como una película!)

3. Un humano amable vio la dificultad del cuervo. El humano vertió 5/12 de taza de agua que había en el jarro en un bebedero de aves plano. Luego, el humano agregó 1/2 taza de agua al bebedero. ¿Cuánta agua tenía ahora el cuervo en el bebedero?