

Brick Math
Basic Fractions Using LEGO® Bricks
Student Assessments - Answer Key

Note: photographs of brick models are shown for most answers, but students will be drawing their models, as shown in Chapter 1, #5.

Chapter 1

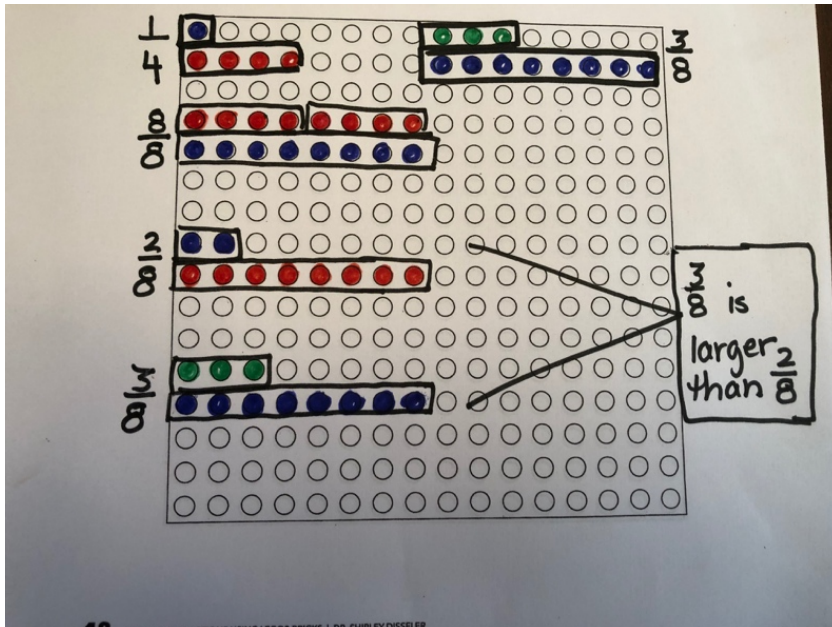
1. The numerator is the top number of the fraction that tells how many parts of the whole are being used.

2. The denominator is the bottom number of the fraction that tells how many parts are in the whole.

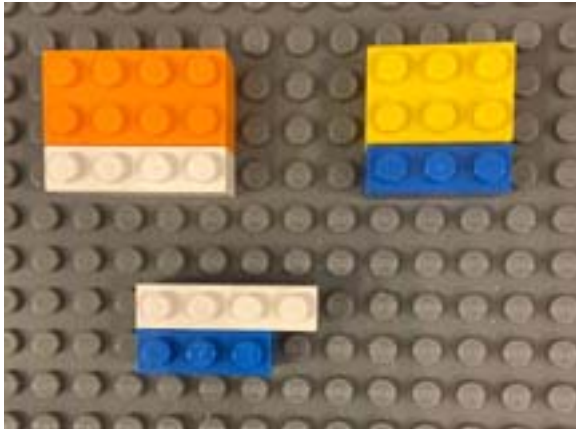
3. 2 5 7 6
 4 6 8 9

4. 3 8 4 2
 7 9 5 7

5.



Chapter 2



The 1x4 brick (white) is half of the 2x4 brick (orange). The 1x3 brick (blue) is half the size of the 2x3 brick (yellow). The 1x4 brick is one stud longer than the 1x3 brick, which shows that half of the 2x4 brick is larger than half of the 2x3 brick.

Chapter 3

1.



The model shows 3 studs over 6 studs plus 2 studs over 6 studs. Bring together the studs for the numerators to show 5 studs over 6 studs, or $5/6$.

2.



The model shows 1 stud over 8 studs plus 3 studs over 8 studs. Bring together the studs for the numerators to show 4 studs over 8 studs, or $4/8$.

Chapter 4

1.



The model shows 3 studs over 6 studs added to 2 studs over 6 studs. Stack the numerator bricks, 2 studs on top of 3 studs. The solution of $1/6$ is shown by the one stud left showing in the numerator and the 6 studs showing in the denominator.

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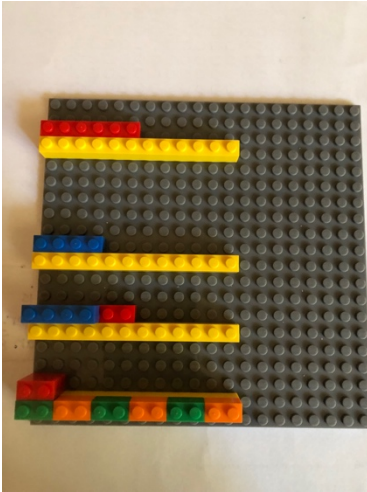
2.



The model shows 4 studs over 8 studs subtracted from 2 studs over 8 studs. Stack the numerator bricks, 2 studs on top of 4 studs. The solution of $2/8$ is shown by the two studs left showing in the numerator and the 8 studs showing in the denominator.

The bottom model shows how to simplify the result. Place one 1x2 brick to cover the numerator and four 1x2 bricks to cover the denominator. This shows the simplified solution of $1/4$. To simplify you need to count the number of bricks and not studs. 1 brick over 4 bricks.

3.



The model shows 6 studs over 12 studs in the first fraction and 4 studs over 12 studs in the second fraction. The third row shows $4/12$ subtracted from $6/12$ as the numerators are stacked. (Stack the numerator bricks, 4 studs on top of 6 studs). The solution of $2/12$ is shown by the two studs left showing in the numerator and the 12 studs showing in the denominator.

The bottom model shows how to simplify the result. Place one 1x2 brick to cover the numerator and six 1x2 bricks to cover the denominator. This shows the simplified solution of $1/6$ when you count the bricks.

Chapter 5

1. 3 is not a factor of 8



The model shows all the factors of 8: 1, 2, 4, and 8. It shows bricks with 8 studs, then 4 studs, then 2 studs, and then 1 stud. Bricks with 3 studs would not fit evenly next to the 1x8 brick.

2. Models will vary. Explanations should be similar to the explanation for question 1.

Chapter 6

1.



These are two different models for 4ths. Each one shows a brick with 4 studs, then 2 bricks with 2 studs each, then 4 bricks with 1 stud each. It shows the equivalent fractions of 4 fourths and 2 halves in the fourths model.

2.

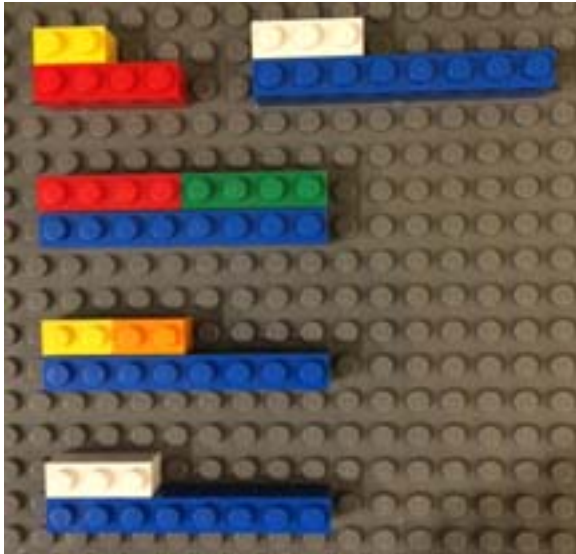


The model shows that each 1x3 brick is equivalent to $\frac{1}{2}$ of the 1x6 brick. This shows that $\frac{3}{6} = \frac{1}{2}$. It is also shown, in the model on the right, because there is one brick in the numerator and two of the same bricks in the denominator.

Chapter 7

1. $<$ $>$ $=$

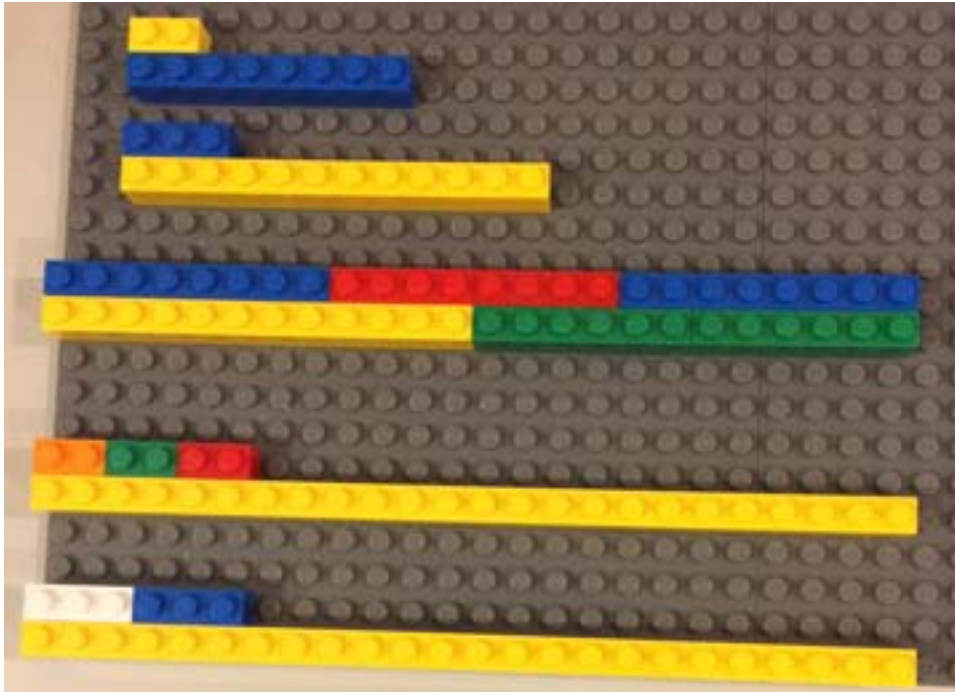
2.



$\frac{2}{4} > \frac{3}{8}$ because $\frac{4}{8} > \frac{3}{8}$

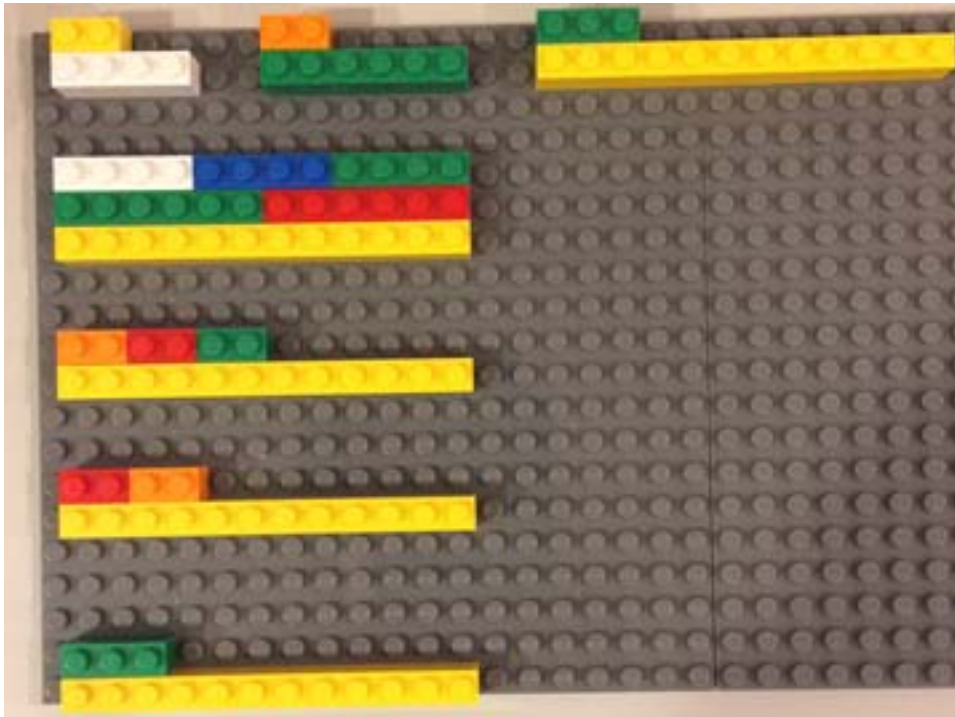
The model shows equivalent denominators but the numerator (4) in the first fraction is larger than the numerator (3) of the second fraction.

3.



$2/8 = 3/12$ because $6/24 = 6/24$

4.



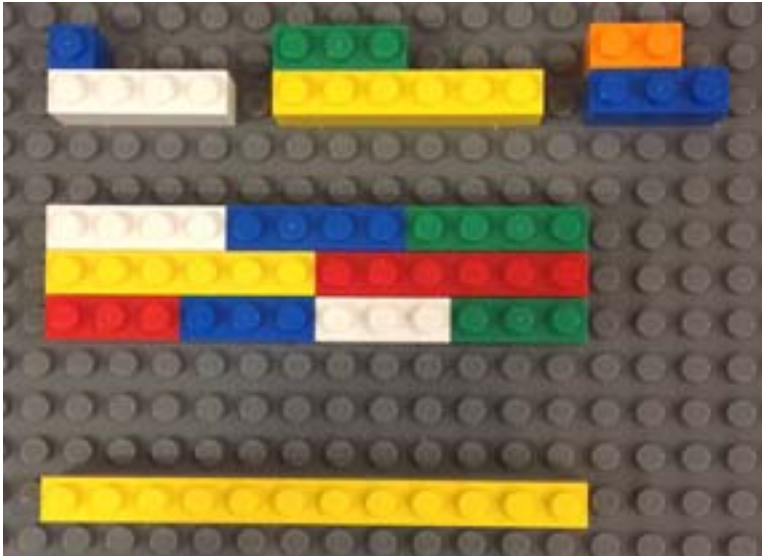
Ordered greatest to least: $2/4$, $2/6$, $3/12$, because $6/12$ is greater than $4/12$, which is greater than $3/12$

$3/12 < 2/4 > 2/6$, because $3/12 < 6/12 > 4/12$

Chapter 8

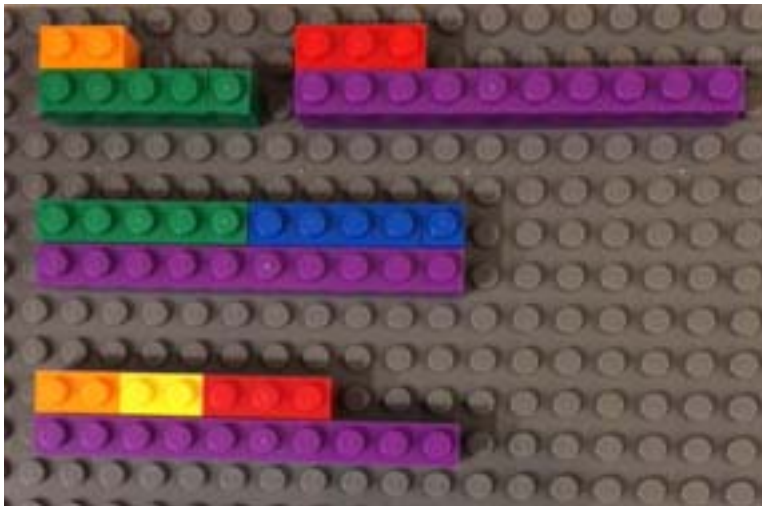
1. Two unlike denominators can be added by finding the **common denominator** of the two denominators.

2.



8 studs represent the equivalent whole.

3.



The model shows 2 studs over 5 studs added to 3 studs over 10 studs. The fraction train shows two 1x5 groups of studs equivalent to one 1x10 brick. That shows the common denominator of 10. The equivalent fractions are $\frac{4}{10}$ and $\frac{3}{10}$.

Adding the numerators, there are two 1x2 bricks plus one 1x3 brick, with 7 studs in total. The solution is $\frac{7}{10}$.

4. The top group of bricks model $5/6$ and $5/12$.

The fraction train modeled shows two 1×6 bricks equivalent to one 1×12 brick. That shows the common denominator of 12.

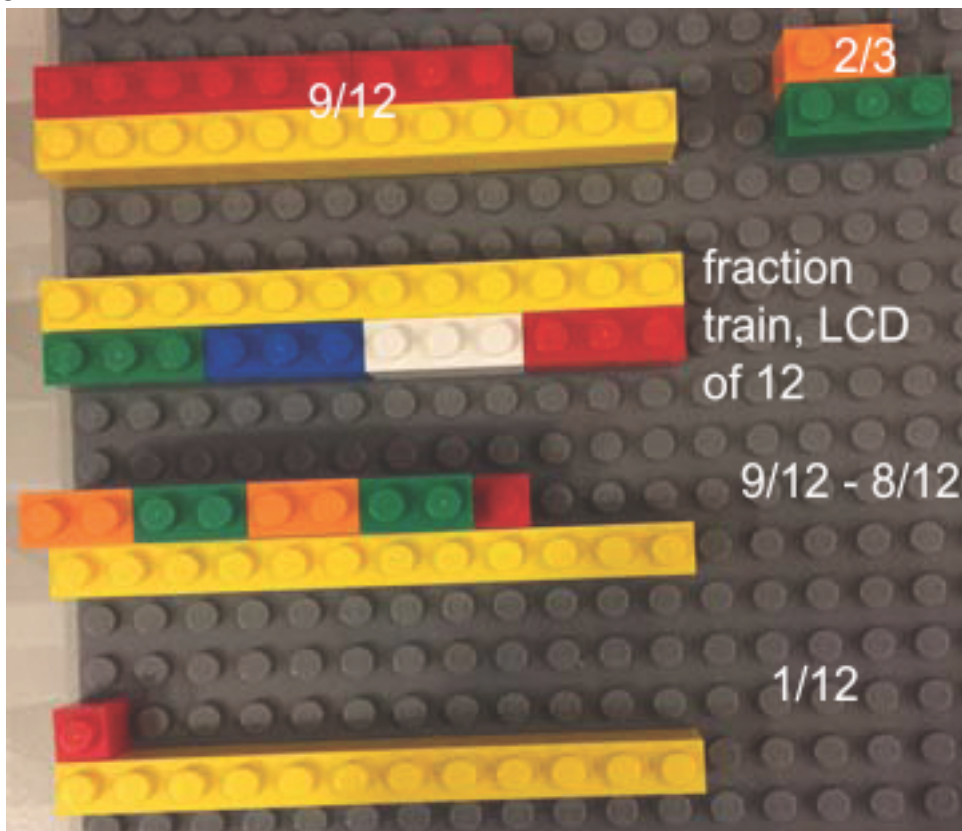
The equivalent fractions are $10/12$ and $5/12$. Added together, they give the solution modeled in the bottom group of $15/12$.

Chapter 9

1. When subtracting *unlike* denominators, it is important to find the common denominator of the fractions.

2. The fraction train model shows the common denominator, or the least common denominator.

3.



4.



Fraction 1 on the top row shows $\frac{5}{6}$

Fraction 2 on the top row shows $\frac{2}{3}$

Fraction train shows LCD of 6.

Row 3 shows subtraction: $\frac{5}{6} - \frac{4}{6}$.

Bottom row shows solution of $\frac{1}{6}$.

5. The *minuend* is $\frac{5}{6}$.

6. The *subtrahend* is $\frac{1}{6}$.

Chapter 10

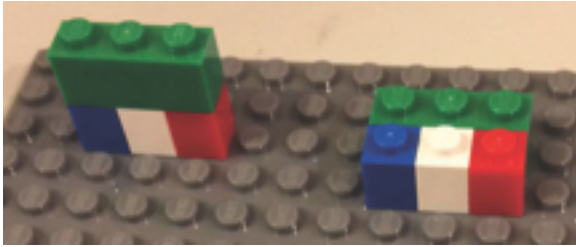
1. (whole numbers in red)

a. $4\frac{2}{3}$

b. $1\frac{5}{6}$

c. $7\frac{3}{4}$

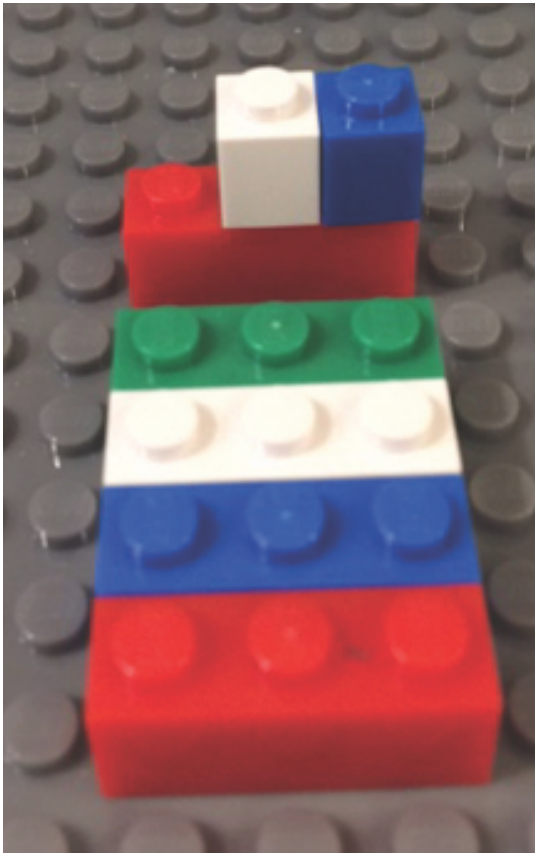
2.



Either of these models show 1 whole as equivalent to $\frac{3}{3}$.

3. A *mixed fraction* or *mixed number* is a value that is a whole number with equivalent numerator and denominator parts and a fraction that shows the left over parts of the whole being used.

4.

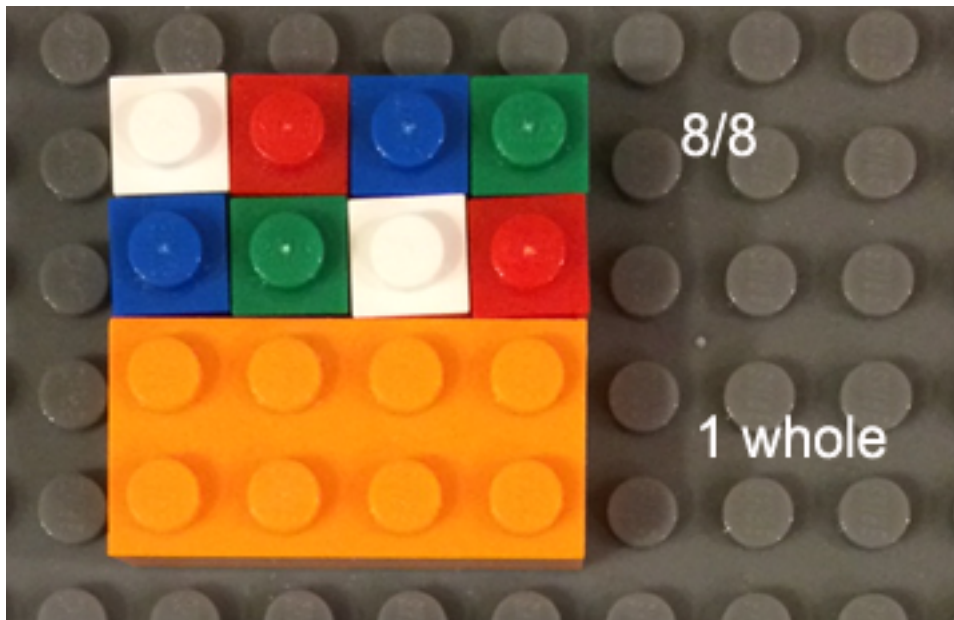


Four 1x3 bricks model 4, the whole number of the mixed number. Two 1x1 bricks on top of another 1x3 brick model $\frac{2}{3}$, the fraction in the mixed number.

Chapter 11

1. Common Denominator

2.



3.

$3/4$ $5/6$

fraction train
LCD of 12

$3/4 + 5/6 = 19/12$
 $19/12 = 1 \frac{7}{12}$

addition of wholes $2 + 1 + 1 = 4$ solution: $4 \frac{7}{12}$

$7/12$

$2 \frac{3}{4} + 1 \frac{5}{6} = 4 \frac{7}{12}$

4.

Step 1: Model the mixed number fractional parts ($\frac{1}{2}$ and $\frac{3}{4}$). The fraction train shows the LCD of 4.

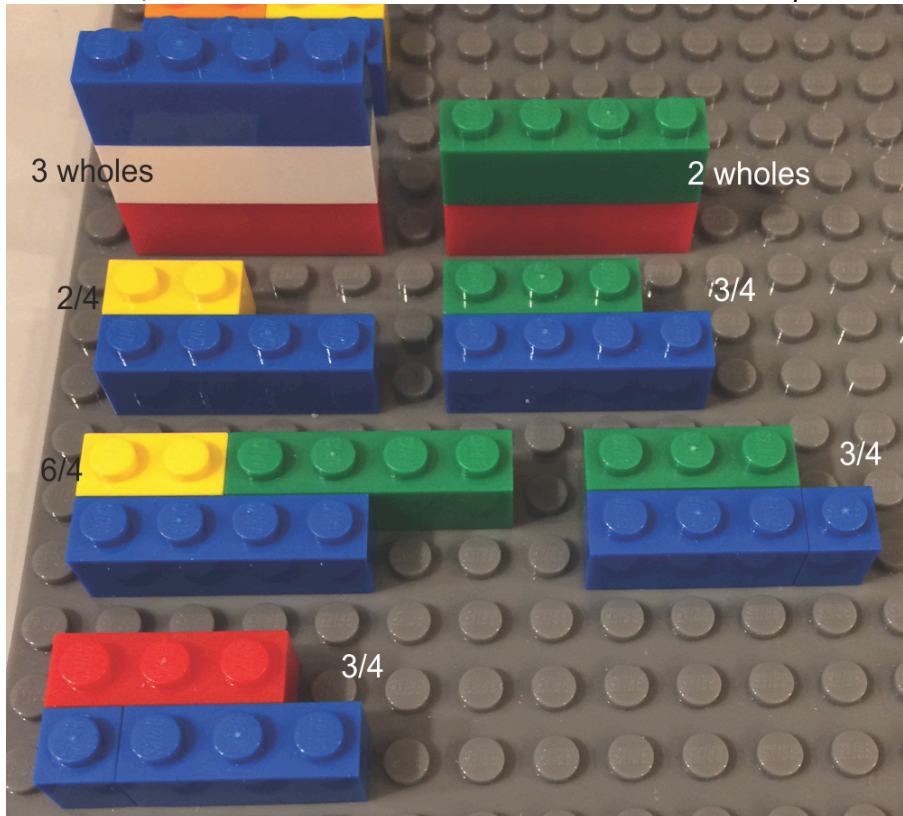
$1/2$ $3/4$

fraction train
LCD of 4

Step 2: Model the mixed number wholes (4 and 2). Model the equivalent fractions for the fractional parts ($\frac{2}{4}$ and $\frac{3}{4}$). $\frac{3}{4}$ cannot be subtracted from $\frac{2}{4}$, so decomposing is needed.

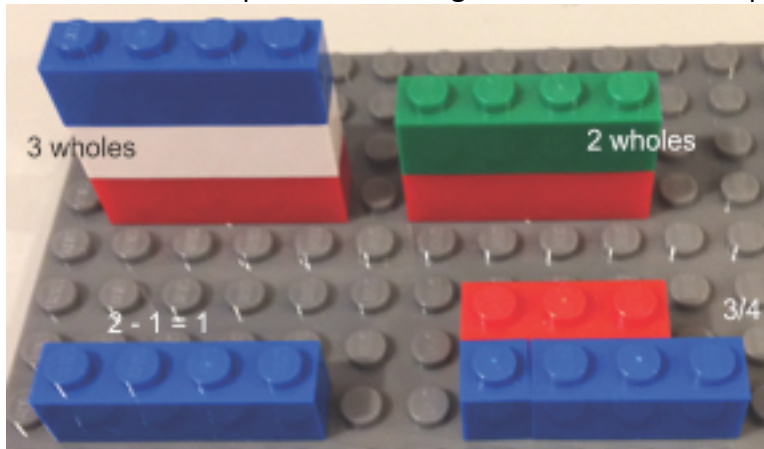


Step 3: Decompose 1 whole from the 4 and add it to the $\frac{2}{4}$, to make the fraction $\frac{6}{4}$. Subtract: $\frac{6}{4} - \frac{3}{4} = \frac{3}{4}$. This is the subtraction of the fractional parts.



Step 4: Subtract the wholes: $3 - 2 = 1$

Add the fractional part solution to get the solution to the problem: $4\frac{1}{2} - 2\frac{3}{4} = 1\frac{3}{4}$



5. Minuend is $4\frac{1}{2}$

Subtrahend is $2\frac{3}{4}$