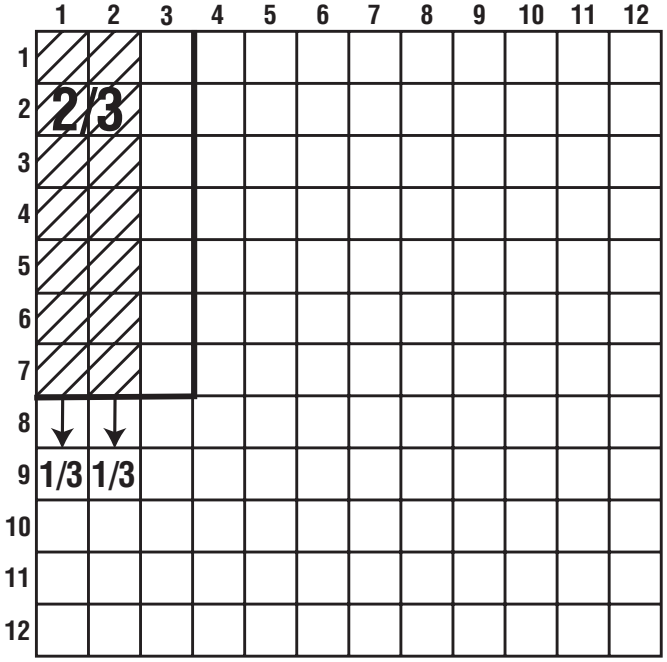
Activity 3: Adding and Subtracting Unlike Proper Fractions: (Answer all questions using correct spelling and grammar.)

The *Unit Grid* will be introduced for working with Unlike Proper Fractions. We will begin by defining what Unlike Proper Fractions are and then describe the process used in working with them.

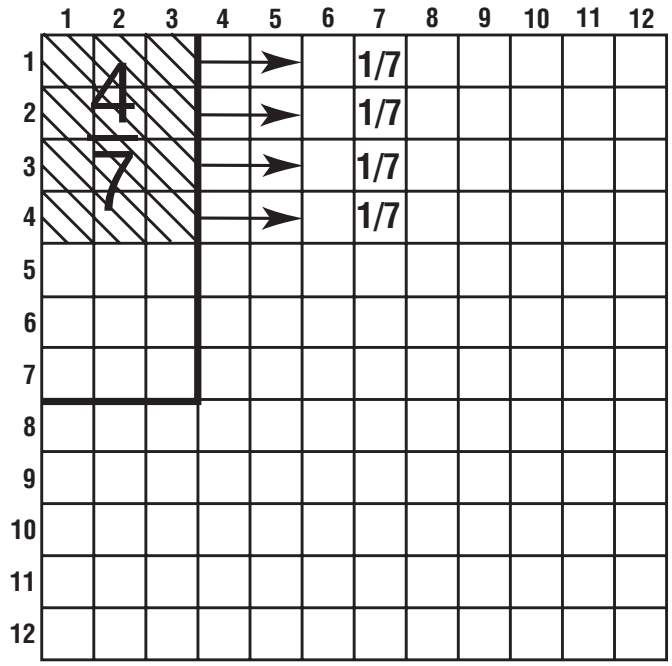
Definition: Unlike Proper Fractions are fractions less than one with unlike denominators. For example: 1/2 + 3/4, or 3/5 − 6/11 would be considered two problems involving Unlike Proper Fractions.

In this Activity we will show a "visual" method for adding or subtracting Unlike Proper Fractions. This method relies on constructing a *Unit Grid*. The best way to understand this is by example. Follow the process below and see if it makes sense to you. In other words, try to not only understand **what** is being done, but **why** it is being done.

Consider the 12 × 12 grid below and the mathematics problem: 2/3 + 4/7



In order to add 2/3 + 4/7 we will use a method that involves defining a **Unit Grid**. To begin with, we will create a *Unit Grid* by looking at the denominators of the fractions in our problem. The two denominators are 3 and 7. So that each person will have the same looking *Unit Grid*, let's agree to always move across using the smaller of the two denominators, in this case 3. And similarly, we will move down using the larger denominator, in this case 7. The *Unit Grid* for this particular problem is the area enclosed by the 3 by 7 grid. In other words, the 21 squares enclosed by the 3 by 7 grid is the *Unit Grid*. The two black heavy lines show the area of the *Unit Grid.* 2/3 of the 21 squares have been shaded with the design: ▨. Notice that we are dividing our *Unit Grid* into thirds by using vertical strips. Since we have chosen to go 3 squares across, each third has 7 squares down, hence we have 14 out of 21 squares shaded, or 14/21= 2/3.

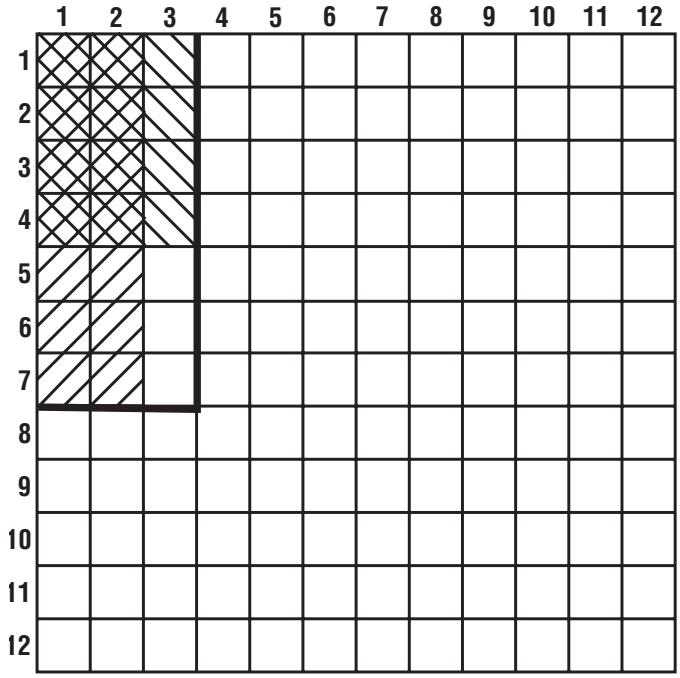


Here we show 4/7 of our *Unit Grid* by shading with the design: Notice that we are dividing our *Unit Grid* into sevenths by using horizontal strips. Since we chose to go 7 down each seventh has 3 squares across, hence we have 12 out of 21 squares shaded, or 12/21= 4/7.

An important point: Note that the denominators show us how to create the *Unit Grid*, while the numerators show us how much of the Unit Grid to shade.

Notice what happens when we combine the above two grids. There appears to be an area of overlap that is represented by the hatched squares: . If we count each of these hatched squares twice and count all the other shaded squares only once, we get 26 for a total. In this case, we are doing both fractions 2/3 and 4/7 on the same grid. (What do you think the hatched area represents?) Note: The reason for displaying both fractions on the same *Unit Grid* will become apparent in future activities.

Summarizing the Unit Grid method for:
2/3 + 4/7



1. Create a 3 by 7 grid by moving across to the number 3 and moving down to the number 7.
2. This 3 by 7 grid we define as our *Unit Grid*.
3. Notice that there are 21 small squares in the *Unit Grid.* Think of this as a "pie" that has been cut into 21 equal size pieces.
4. Two-thirds of the *Unit Grid* (14 squares) have been shaded with lines going from the bottom left to the top right:
5. Four-sevenths of the *Unit Grid* (12 squares) have been shaded with lines going from the top left to the bottom right:
6. The total number of squares is 14 + 12 = 26, out of a unit number of 21. In other words 26/21, is the answer. Thus: 14/21 + 12/21= 26/21, which is 2/3 + 4/7.

1. Use the Grids provided at the end of this Activity for exercise 1. Fill in your answers below.

a) 2/3 + 3/7 = _____ d) 4/5 − 1/3 = _____ g) 1/4 + 1/6 = _____

b) 2/3 − 3/7 = _____ e) 8/11 + 3/8 = _____ h) 1/4 - 1/6 = _____

c) 4/5 + 1/3 = _____ f) 8/11 − 3/8 = _____ i) 1/2 + 1/12 = _____

* j) 1/2 + 1/3 + 1/4 = _____ *k) 1/2 − 1/3 + 1/4 = _____

*(Hint) Work with the first two fractions and then work with the third fraction.

Questions:

2. Why is it important to define a ***Unit*** Grid?

Your explanation: _____

_____

3. How would you have used the Unit Grid method to work out 2/3 - 4/7?

Your explanation: _____

_____

4. Would it have mattered in the above example if you had chosen to form a 7 by 3 Unit Grid (that is, 7 across and 3 down) rather than a 3 by 7 Unit Grid?

yes or no (circle one).

Your explanation: _____

5. What geometric shape would a Unit Grid have if you were adding or subtracting two like fractions?

The shape would be a _____ because _____
(Use the Unit Grid to add 3/7 + 5/7.)

6. After the two fractions have been marked on the Unit Grid we see three designs: Using these three designs, how would you explain to someone how to add the fractions?

Your explanation: _____

_____

_____

_____

7. How could you restate your above answer without referring to the hatched squares?

Your explanation: _____

_____

_____

8. How would you explain subtraction to someone using the Unit Grid? Would you make reference to the hatched squares?

Your explanation: _____

_____

9. Using your own words, tell what you learned in doing Activity # 3. Discuss anything you may have found confusing about the Activity.

_____

_____

_____

_____

_____

Activity 3: 1a - 1f

1a) 2/3 + 3/7 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1b) 2/3 − 3/7 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1c) 4/5 + 1/3 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1d) 4/5 − 1/3 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1e) 8/11 + 3/8 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1f) 8/11 − 3/8 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

Activity 3: 1g - 1k

1g) 1/4 + 1/6 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1j-a) 1/2 + 1/3 + ( ) =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1h) 1/4 − 1/6 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1j-b) ( ) + 1/4 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

1i) 1/2 + 1/12 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

*1k) 1/2 − 1/3 + 1/4 =

	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

*Use Grid 1j-a to determine 1/2 − 1/3