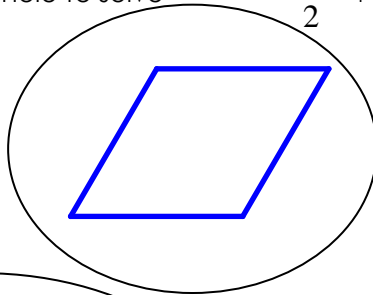
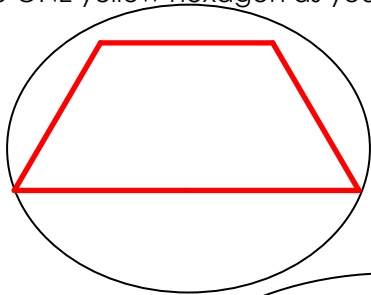


# ADDING AND SUBTRACTING FRACTIONS

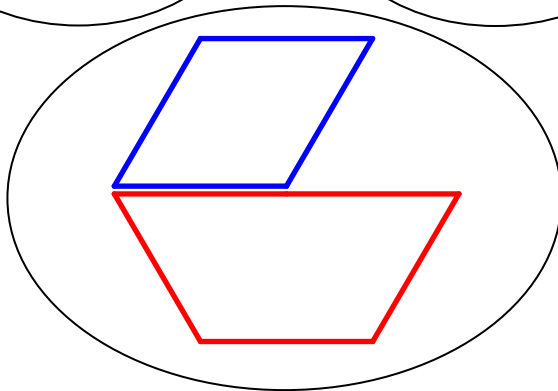
## Exploration # 1: Adding Fractions with Pattern Blocks

We can use the "union of two (or more) disjoint sets" model of addition to add fractions.

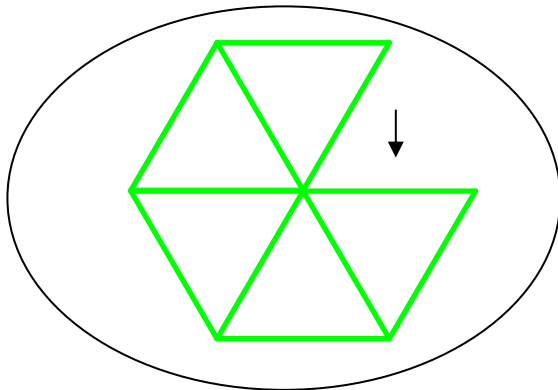
Example: Use ONE yellow hexagon as your whole to solve  $\frac{1}{2} + \frac{1}{3}$



Represent  $\frac{1}{2}$  with 1 red block and  $\frac{1}{3}$  with 1 blue block.



Take the union of the disjoint sets



Rename your fraction with equal parts ( $= \frac{5}{6}$ )

Add:

a)  $\frac{2}{3} + \frac{1}{6}$

b)  $\frac{1}{2} + \frac{5}{6}$

Use TWO yellow hexagons as your whole to solve:

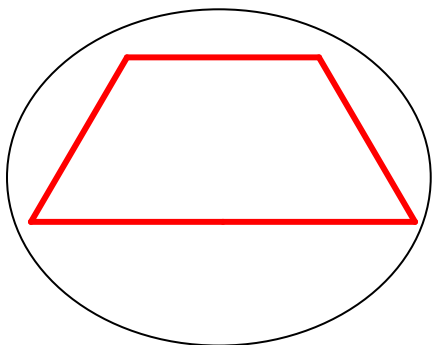
c)  $\frac{1}{2} + \frac{5}{12}$

d)  $\frac{3}{4} + \frac{1}{6} + \frac{1}{2}$

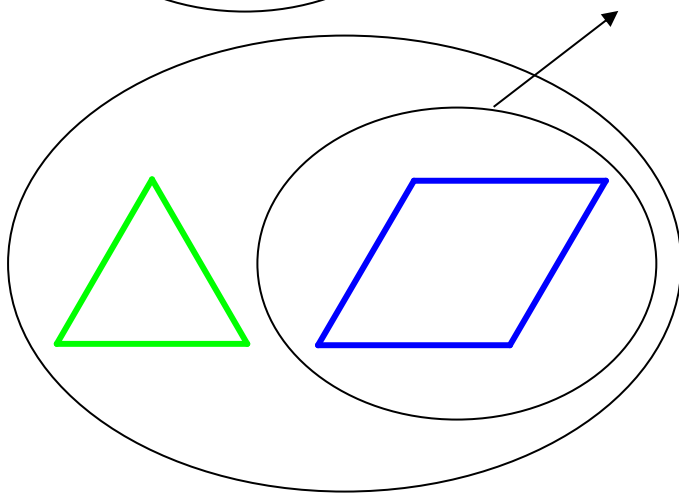
Exploration # 2: Subtracting Fractions with Pattern Blocks

We can use the “take-away set” model of subtraction to subtract fractions.

Example: Use ONE yellow hexagon as your whole to solve:  $\frac{1}{2} - \frac{1}{3}$

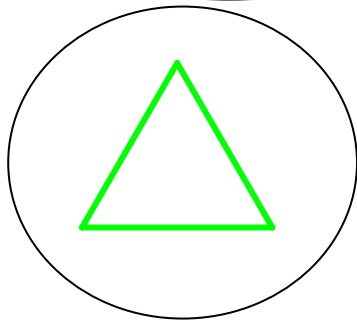


You start with  $\frac{1}{2}$



You want to take away  $\frac{1}{3}$  (= 1 blue).

Since you don't have a blue block to take away, you exchange your red block for one green block and one blue block, then, then you take away 1 blue.



You are left with 1 green triangle (=  $\frac{1}{6}$ )!

Subtract:

a)  $\frac{1}{2} - \frac{1}{6}$

$$\text{b) } \frac{2}{3} - \frac{1}{2}$$

Use TWO yellow hexagons as your whole to solve:

$$\text{c) } \frac{5}{6} - \frac{3}{4}$$

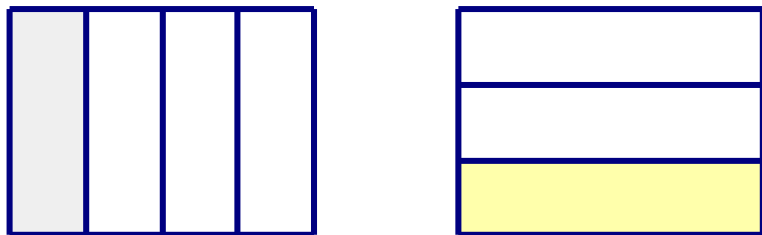
$$\text{d) } 1\frac{5}{12} - \frac{5}{6}$$

### Exploration # 3: Adding Fractions Using Rectangles

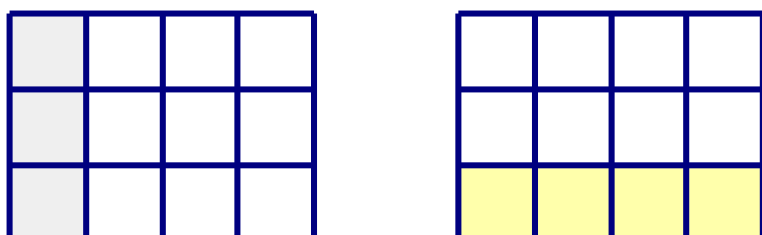
We can use a rectangle model to add fractions.

Example: Add  $\frac{1}{4}$  and  $\frac{1}{3}$

We will divide one rectangle into fourths vertically and one rectangle into thirds horizontally.

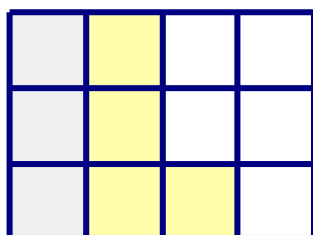


Now we divide the fourths into thirds and the thirds into fourths:



Note that  $\frac{1}{4}$  is equivalent to  $\frac{3}{12}$  and  $\frac{1}{3}$  is equivalent to  $\frac{4}{12}$ .

We can join (union) the three fourths and the four thirds:



Our answer is  $\frac{7}{12}$ !

Note: it's OK to do the first two steps at once (i.e. divide your two rectangles into fourths and thirds and then use the same rectangles to go to twelfths). You'll still need to show your union.

Use the rectangle method to add:

a)  $\frac{2}{5} + \frac{1}{3}$

b)  $\frac{3}{4} + \frac{5}{6}$

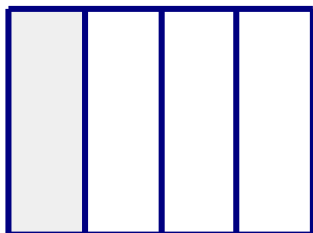
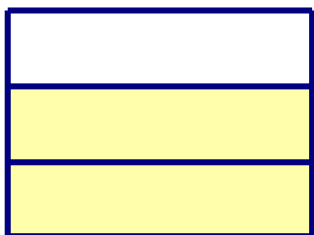
c)  $1\frac{1}{4} + 2\frac{3}{8}$

Exploration # 4: Subtracting Fractions Using Rectangles

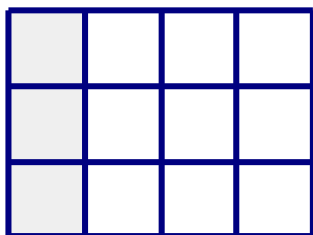
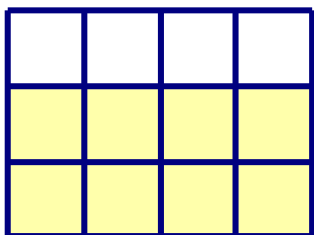
We can use a rectangle model to subtract fractions.

Example: Subtract  $\frac{1}{4}$  from  $\frac{2}{3}$

We will divide one rectangle into thirds horizontally, shade two thirds, and then divide one rectangle into fourths vertically, shade one fourth.

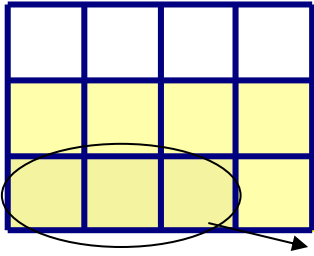


Now we divide the fourths into thirds and the thirds into fourths:



Note that  $\frac{2}{3}$  is equivalent to  $\frac{8}{12}$  and  $\frac{1}{4}$  is equivalent to  $\frac{3}{12}$ .

We can take away the three twelfths (= one fourth) from the eight twelfths (=two thirds):



Our answer is what is leftover:  $\frac{5}{12}$ !

Note: it's OK to do the first two steps at once (i.e. divide your two rectangles into fourths and thirds and then use the same rectangles to go to twelfths). You'll still need to show your take away step.

Use the rectangle method to subtract:

a)  $\frac{3}{4} - \frac{2}{5}$

b)  $2\frac{1}{4} - 1\frac{3}{5}$

## Addition and Subtraction of Fractions: Applications

1. Julie jogged four and one-fifth miles on Saturday. She jogged one and a third miles to the store and one-fourth of a mile to the park. How many miles did she jog going places other than the store and the park?
2. Lauren put one-fifth of a cup of sugar into the bowl. She then added one and two-fifths cups more. Realizing that she put in too much, she removed two-thirds of a cup. How much sugar was left in the bowl?
3. Stephanie cut twelve and a half yards of material. Of those, three and two-sevenths yards were yellow and one and one-seventh yards were red. How much material was not yellow or red?
4. During one evening Kathleen devoted  $\frac{2}{5}$  of her study time to mathematics,  $\frac{3}{20}$  of her time to Spanish,  $\frac{1}{3}$  of her time to biology, and the remaining 35 minutes to English. How much time did she spend studying her Spanish?