Manipulative Mathematics   **Name**_____
**Model Fraction Multiplication**

When you multiply fractions, do you need a common denominator? Do you take the reciprocal of one of the fractions? What are you supposed to do and how are you going to remember it? A model may help you understand multiplication of fractions.


1) Model the product $\frac{1}{2} \cdot \frac{3}{4}$.

  (a) To multiply $\frac{1}{2}$ and $\frac{3}{4}$, let's think " $\frac{1}{2}$ of $\frac{3}{4}$ ".

  (b) First, we draw a rectangle to represent one whole. We divide it vertically into 4 equal

  parts, and then shade in three of the parts to model $\frac{3}{4}$.

We have shaded in $\frac{3}{4}$ of the rectangle.
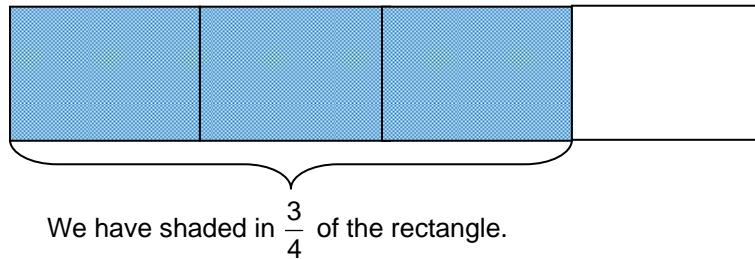
  (c) Now, we divide the rectangle horizontally into two equal parts to divide the whole into

  halves. Then we double-shade $\frac{1}{2}$ of what was already shaded.
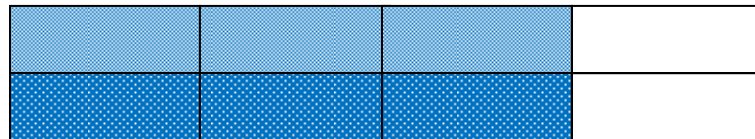
  (d) Into how many equal pieces is the rectangle divided now? _____

  (e) How many of these pieces are double-shaded? _____

We double-shaded 3 out of the 8 equal pieces, $\frac{3}{8}$ of the rectangle. So $\frac{1}{2}$ of $\frac{3}{4}$ is $\frac{3}{8}$.

We showed that

$$\frac{1}{2} \cdot \frac{3}{4} = \frac{3}{8}$$

Notice –
multiplying the numerators $1 \cdot 3 = 3$
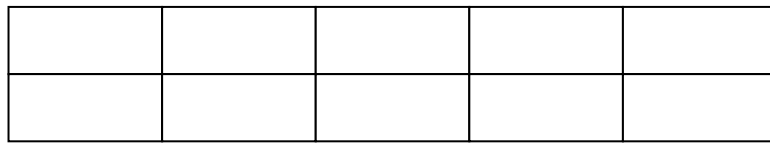multiplying the denominators $2 \cdot 4 = 8$

2) Model the product $\dfrac{1}{2} \cdot \dfrac{3}{5}$.

    (a) To multiply $\dfrac{1}{2}$ and $\dfrac{3}{5}$, think "$\dfrac{1}{2}$ of_____".

    (b) First shade in $\dfrac{3}{5}$ of the rectangle.

    (c) Now double-shade $\dfrac{1}{2}$ of what was already shaded.

    (d) Into how many equal pieces is the rectangle divided now? _____

    (e) How many pieces are double-shaded? _____

    (f) What fraction of the rectangle is double-shaded? _____

    (g) So $\dfrac{1}{2}$ of $\dfrac{3}{5}$ is _____.

        You have shown that
$$\dfrac{1}{2} \cdot \dfrac{3}{5} = \dfrac{3}{10}$$

        Notice –
multiplying the numerators $1 \cdot 3 = 3$
multiplying the denominators $2 \cdot 5 = 10$

3) Use a rectangle to model each product. Sketch a diagram to illustrate your model.

    (a) $\dfrac{1}{2} \cdot \dfrac{1}{3}$

$$\dfrac{1}{2} \cdot \dfrac{1}{3} = \text{____}$$

(b) $\dfrac{1}{2} \cdot \dfrac{1}{4}$

$\dfrac{1}{2} \cdot \dfrac{1}{4} =$ ____

(c) $\dfrac{1}{3} \cdot \dfrac{1}{4}$

$\dfrac{1}{3} \cdot \dfrac{1}{4} =$ ___

(d) $\dfrac{1}{3} \cdot \dfrac{2}{3}$

$\dfrac{1}{3} \cdot \dfrac{2}{3} =$ ___

(e) $\dfrac{2}{3} \cdot \dfrac{4}{5}$

$\dfrac{2}{3} \cdot \dfrac{4}{5} =$ ___

4) Look at each of your models and answers in Question 3.

    (a) If you multiply numerators and multiply denominators, do you get the same result as you did from the model? _____

    (b) Explain in words how to multiply two fractions.

5) The definition of fraction multiplication is given in the box below.

Fraction Multiplication

If a, b, c, and d are numbers where $b \neq 0 \text{ and } d \neq 0$, then $\dfrac{a}{b} \cdot \dfrac{c}{d} = \dfrac{ac}{bd}$.

To multiply fractions, multiply the numerators and multiply the denominators.

Use the definition of fraction multiplication to multiply $\dfrac{5}{12} \cdot \dfrac{7}{3}$

(a) Identify a, b, c, and d.

(b) Multiply the fractions.