Math 4a. Class work 7. **Fractions. Addition, subtraction, multiplication, division.**

Warm up:

Represent as a mixed number:

$\frac{10}{17} =$; $\frac{15}{4} =$; $\frac{18}{9} =$; $\frac{10}{3} =$; $\frac{64}{7} =$;

Represent as improper fractions:

$1\frac{4}{7} =$; $3\frac{1}{10} =$; $1\frac{9}{14} =$; $2\frac{3}{11} =$; $5\frac{7}{100} =$;

Addition and subtraction of mixed numbers.

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

$\frac{1}{4} + 3\frac{1}{6} =$

$5\frac{5}{12} + 3\frac{2}{9} =$

$2\frac{4}{9} + \frac{1}{6} =$

$4\frac{3}{5} + 10\frac{1}{4} =$

$2\frac{1}{3} - 1\frac{1}{2} =$

$4\frac{1}{5} - 2\frac{3}{10} =$

$7\frac{1}{9} - 4\frac{1}{3} =$

$2\frac{2}{7} - 1\frac{3}{5} =$

$6\frac{1}{4} - 3\frac{2}{5} =$

Multiplication of fraction by a number.

To multiply a fraction by a number, simply multiply the numerator by the number:

$$\frac{2}{7} \cdot 3 = \frac{2}{7} + \frac{2}{7} + \frac{2}{7} = \frac{2+2+2}{7} = \frac{3 \cdot 2}{7} = \frac{6}{7}$$

On the other hand:

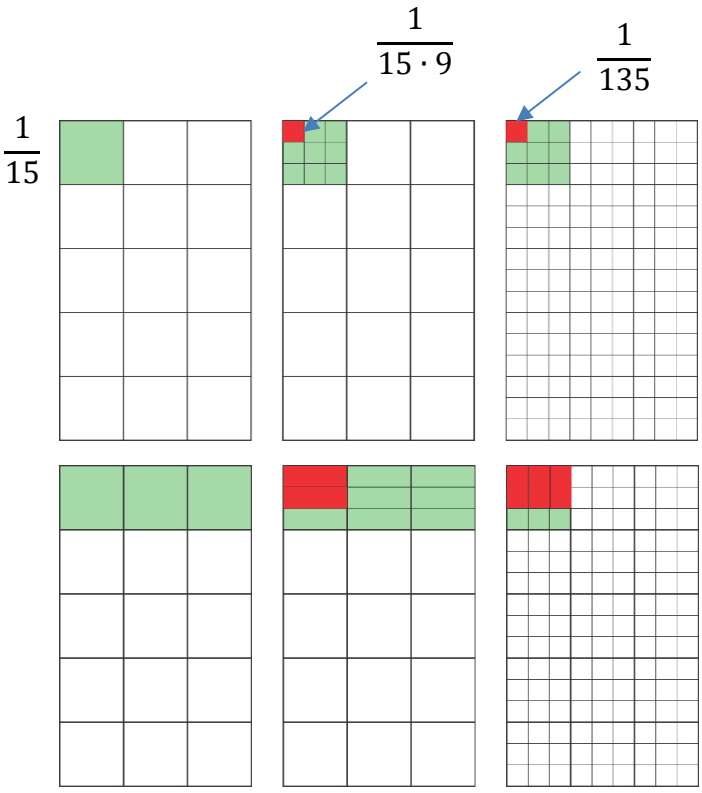
$$\frac{2}{7} \cdot 3 = 3 \cdot \frac{2}{7} = 3 : 7 \cdot 2 = 3 \cdot 2 : 7$$

Multiplication of fraction by a fraction.

$\frac{1}{15}$ is a part of a whole divided into 15 equal small parts.

If we want to take $\frac{1}{9}$ part of this little $\frac{1}{15}$ chunk we have to divide it into 9 even smaller pieces, to find $\frac{1}{9}^{\text{th}}$ of $\frac{1}{15}^{\text{th}}$.

$$\frac{1}{15} : 9 = \frac{1}{15} \cdot \frac{1}{9} = \frac{1}{15 \cdot 9} = \frac{1}{135}$$



If we need to take two small $\frac{1}{9}$ of $\frac{1}{15}$

$$\frac{1}{15} : 9 \cdot 2 = \frac{1}{15} \cdot \frac{2}{9} = \frac{1 \cdot 2}{15 \cdot 9} = \frac{2}{135}$$

Or we want to find out $\frac{2}{9}$ of $\frac{3}{15}$.

$$\frac{3}{15} : 9 \cdot 2 = \frac{3}{15} \cdot \frac{2}{9} = \frac{3 \cdot 2}{15 \cdot 9} = \frac{6}{135}$$

To multiply two fractions, we need to multiply numerators, multiply denominators and reduce fraction, if possible.

Examples:

$$\frac{3}{8} \cdot \frac{2}{7} = \frac{3 \cdot 2}{4 \cdot 2 \cdot 7} = \frac{3 \cdot 2}{4 \cdot 7 \cdot 2} = \frac{3}{4 \cdot 7} = \frac{3}{28}$$

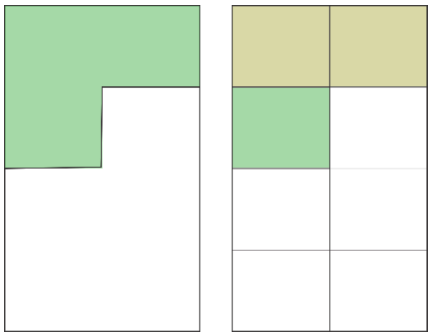
Division of fractions.

More of multiplication of fractions:

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

So, division of $\frac{1}{4}$ by $\frac{2}{3}$ should give the quotient $\frac{3}{8}$.

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



We can notice that the multiplication of $\frac{1}{4}$ by the inverse fraction $\frac{3}{2}$ will bring exactly $\frac{3}{8}$;

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

To divide one fraction by another we need to multiply the dividend by the inverse fraction. Two fractions are inverse fractions if their product is 1. Inverse fractions can also be called reciprocal.

Examples:

$$\frac{1}{4}\cdot\frac{4}{1}=1; \qquad \frac{3}{5}\cdot\frac{5}{3}=1; \qquad \frac{4}{7}\cdot\frac{7}{4}=1;$$

Exercise:

1. Evaluate:

$\frac{4}{5}\cdot\frac{5}{7}=$	$\frac{2}{3}:\frac{5}{7}=$
$\frac{8}{9}\cdot\frac{3}{5}=$	$\frac{1}{4}:\frac{1}{2}=$
$\frac{9}{2}\cdot\frac{2}{9}=$	$\frac{4}{9}:\frac{8}{9}=$
$\frac{8}{21}\cdot\frac{7}{10}=$	$\frac{3}{4}:\frac{1}{2}=$
$\frac{8}{15}\cdot\frac{25}{28}=$	$\frac{5}{6}:\frac{7}{12}=$

2. Painter painted $\frac{2}{7}$ of the house is 4 days. How many days will take him to paint the whole house?

3. Evaluate:

$$\frac{3}{7}\cdot 2; \qquad 3\cdot\frac{1}{6}; \qquad 9\cdot\frac{5}{6}; \qquad 2\frac{1}{3}\cdot 2; \qquad 4\cdot 1\frac{1}{2};$$

4. Melon weighs 7 pounds, and the watermelon is $1\frac{1}{5}$ times heavier. How many pounds is watermelon is heavier than the melon?

5. $4\frac{1}{2}$ kg. of candies were packed into $\frac{1}{2}$ kg packages. How many packages were the candies packed into?