Dividing Fractions and Mixed Numbers

6 ÷ 3 is asking, "How many 3s are in 6?"

6 items

one group of 3   a second group of 3
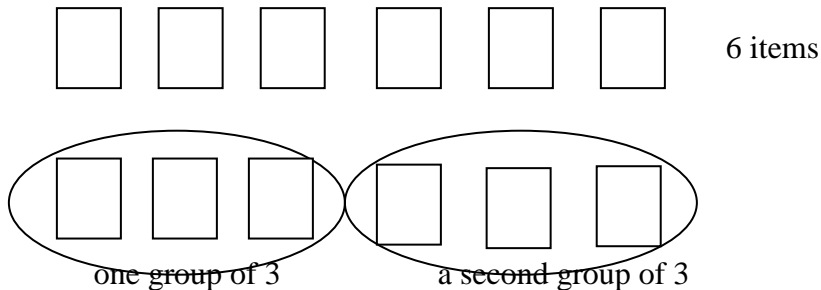
We see that there are 2 groups of 3 in 6.

6 ÷ ½ asks "How many ½'s are in 6?"

6 items

Each item halved
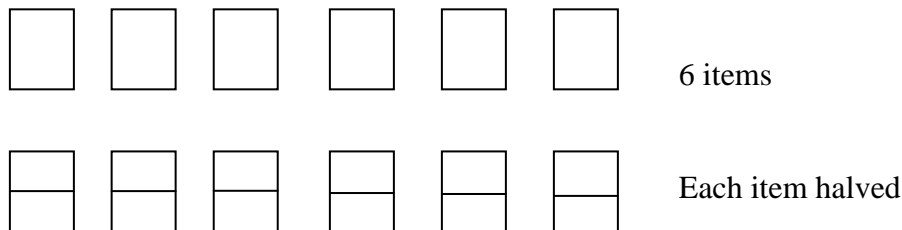
We see that there are 12 one-half size objects in 6 objects.

NOTICE: $6 \div \dfrac{1}{2}$ is 12 which can be found by multiplying $\dfrac{6}{1} \times \dfrac{2}{1}$. $\dfrac{2}{1}$ is the reciprocal of $\dfrac{1}{2}$ and their **product** is 1.

$$\frac{2}{1} \cdot \frac{1}{2} = \frac{2}{2} = 1$$

RULE: To divide fractions we first write a multiplication that gives the same answer. We keep the **same** first number (the dividend does not change). We multiply by the reciprocal of the second number (we use the reciprocal of the divisor).

The reciprocal of a number is found by changing places with the numerator and denominator. This is called **inverting**. **REMEMBER the product of a number and its reciprocal is always 1.**

The reciprocal of $\dfrac{3}{4}$ is $\dfrac{4}{3}$ Check $\dfrac{3}{4} \cdot \dfrac{4}{3} = \dfrac{12}{12} = 1$

To find the reciprocal of a mixed number, first write it as a fraction. Then write the reciprocal of the fraction.

$7\dfrac{3}{5}$ is $\dfrac{38}{5}$ The reciprocal of $\dfrac{38}{5}$ is $\dfrac{5}{38}$, so the reciprocal of $7\dfrac{3}{5}$ is $\dfrac{5}{38}$.

The reciprocal of 4 is also the reciprocal of $\dfrac{4}{1}$. It is $\dfrac{1}{4}$.

CHECK: $\dfrac{4}{1} \cdot \dfrac{1}{4} = \dfrac{4}{4} = 1$

Use the rule to divide:

EXAMPLES: a. $\dfrac{3}{8} \div \dfrac{5}{6} = \dfrac{3}{8} \times \dfrac{6}{5}$ Same first number × reciprocal of second number!

$= \dfrac{3 \times (2 \times 3)}{(2 \times 4) \times 5}$ NOTICE: We do not cancel until we write the equivalent multiplication problem.

$= \dfrac{9}{20}$

b. $4\dfrac{1}{5} \div 6\dfrac{3}{4} = \dfrac{21}{5} \div \dfrac{27}{4}$ Write mixed numbers as fractions.

$= \dfrac{21}{5} \times \dfrac{4}{27}$ Multiply by the reciprocal of the <u>divisor</u>.

$= \dfrac{(3 \times 7) \times 4}{5 \times (3 \times 9)}$ Simplify by canceling common factors and multiply

$= \dfrac{28}{45}$

c. $8 \div 2\dfrac{5}{6} = \dfrac{8}{1} \div \dfrac{17}{6} = \dfrac{8}{1} \times \dfrac{6}{17} = \dfrac{48}{17} = 2\dfrac{14}{17}$

1–6. Divide and simplify.

1. $\dfrac{3}{8} \div \dfrac{2}{3}$ 2. $8 \div \dfrac{3}{5}$ 3. $\dfrac{5}{6} \div 3$

4. $8\dfrac{1}{3} \div 2\dfrac{1}{2}$ 5. $6\dfrac{3}{4} \div 9$ 6. $7\dfrac{1}{8} \div 8\dfrac{2}{3}$

REMEMBER $\dfrac{5}{6} \div \dfrac{3}{8}$ means $\dfrac{5}{6}$ is divided <u>by</u> $\dfrac{3}{8}$. It is also said that $\dfrac{3}{8}$ is divided <u>into</u> $\dfrac{5}{6}$. It's "dividend ÷ divisor."

7–10. Write the division problem and divide.

7. $\dfrac{3}{4}$ divided <u>by</u> $\dfrac{5}{6}$

8. $\dfrac{3}{4}$ divided <u>into</u> $\dfrac{5}{6}$

9. $7\dfrac{1}{2}$ divided <u>by</u> 3

10. $8\dfrac{9}{4}$ divided into 760

11. If a division problem has whole numbers divided with fractions, or if it has mixed numbers, the _____and _____ must be written as _____.

12. Write the rule for dividing fractions.

13. A number multiplied by its reciprocal <u>must</u> have a product of_____.

14. Are common denominators needed in division?

<u>**ANSWERS:**</u>

1. $\dfrac{9}{16}$ 2. $13\dfrac{1}{3}$ 3. $\dfrac{5}{18}$ 4. $3\dfrac{1}{3}$ 5. $\dfrac{3}{4}$ 6. $\dfrac{171}{208}$

7. $\dfrac{3}{4} \div \dfrac{5}{6} = \dfrac{9}{10}$ 8. $\dfrac{5}{6} \div \dfrac{3}{4} = 1\dfrac{1}{9}$ 9. $7\dfrac{1}{2} \div 3 = 2\dfrac{1}{2}$ 10. $760 \div 8\dfrac{4}{9} = 90$

11. <u>Whole numbers</u> and <u>mixed numbers</u> must be written as <u>improper fractions</u>.

12. The first fraction is multiplied by the reciprocal of the   second fraction.

13. one

14. no

It will help you to remember these if you write the answers in complete sentences! Try it!

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