

Algebra.

Multiplication and division of fractions.

Peter and 2 of his friends want to divide 2 chocolate bars evenly:

$$2 \div 3 = \frac{2}{3} = 2 \times \frac{1}{3}$$

You can see that the division by 3 (to find $\frac{1}{3}$ of 2 chocolate bars) is the same as multiplication by $\frac{1}{3}$. Also Peter has 18 candies. He wants to give to his friends $\frac{2}{3}$ of his candies. To find how many candies Peter should give to his friends he has to divide the number of candies by 3 and multiply by 2:

$$18 \div 3 \times 2 = 18 \times 2 \div 3 = \frac{18}{3} \times 2 = \frac{18 \times 2}{3} = 18 \times \frac{2}{3} = \frac{2}{3} \times 18$$

Fractions.

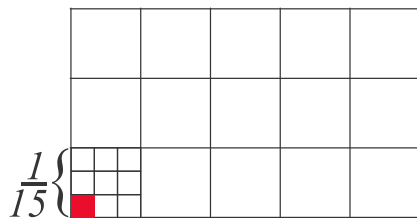
Multiplication of fraction.

What does it mean to multiply one fraction by another?

If we want to multiply a whole number by a fraction, it means we are dividing this number by the denominator of the fraction and are multiplying by the numerator and, as a result, we will get fraction part of our whole number.

$$\frac{2}{3} \text{ of } 15 \text{ is } 15 \div 3 \times 2 = 10 = \frac{2}{3} \times 15$$

Now we want to find $\frac{1}{9}$ out of $\frac{1}{15}$.

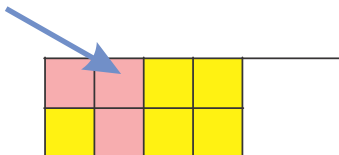


$$\frac{1}{9} \times \frac{1}{15} = \frac{1}{15} \div 9 = \frac{1}{15 \times 9} = \frac{1}{135}$$

$$\frac{2}{9} \times \frac{1}{15} = \frac{1}{15} \div 9 \times 2 = \frac{1 \times 2}{15 \times 9} = \frac{2}{135}$$

More of fraction multiplication:

$$\frac{3}{8} \times \frac{2}{3} = \frac{2}{3} \div 8 \times 3 = \frac{2 \times 3}{8 \times 3} = \frac{2}{8} = \frac{1}{4}$$



What does it mean that $\frac{3}{8} \times \frac{2}{3} = \frac{1}{4}$? It really means that $\frac{1}{4} \div \frac{3}{8} = \frac{2}{3}$ It is easy to see that

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

And $\frac{1}{4} \div \frac{2}{3} = \frac{3}{8}$. So

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

Let's try to look at this problem differently. If we are saying that $10 \div 2 = 5$ it means that 2 can fit into 10 five times (and $10 \div 5 = 2$ means that 5 can fit into 10 two times.)

Expression $\frac{3}{10} \div \frac{3}{5} = \frac{1}{2}$ means that $\frac{3}{5}$ can fit into $\frac{3}{10}$ only $\frac{1}{2}$ times.



We can see that to multiply 2 fractions one should multiply numerators and denominators. To divide one fraction by another we have to multiply first fraction by the fraction reciprocal to the second fraction. Two fractions are called reciprocal (or inverse) if their product is equal to 1.

$$\frac{3}{5} \times \frac{5}{3} = 1, \quad \frac{a}{b} \times \frac{b}{a} = 1$$

1. Compute:

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

$$\frac{7}{15} - \frac{1}{5} =$$

$$\frac{5}{12} + \frac{4}{15} =$$

2. Simplify the following fractions:

$$\frac{22}{66}, \frac{125}{75}, \frac{75}{100}, \frac{24}{360}, \frac{125}{1000}, \frac{100}{250}, \frac{198}{126},$$

$$\frac{2 \cdot 3}{4 \cdot 5}, \frac{2 \cdot 3}{7 \cdot 2}, \frac{5 \cdot 4}{4 \cdot 9}, \frac{7 \cdot 5}{2 \cdot 7}$$

3. Compute

$$\frac{9 \cdot 4 \cdot 5}{20 \cdot 8 \cdot 15} =$$

$$\frac{2}{3} \cdot \frac{6}{7} \cdot \frac{1}{10} =$$

$$\frac{2}{9} \cdot \frac{3}{7} \div \frac{5}{12} =$$

$$\frac{1}{3} \cdot 90 \cdot \frac{1}{5} =$$

$$\frac{9}{10} \div \frac{10}{11} \cdot \frac{100}{21} =$$

$$36 \cdot \frac{1}{12} \cdot \frac{1}{3} =$$

4. $\frac{12 \times 5 + 12 \times 9}{12 \times 21} =$

$$\frac{14 \times 5 + 14 \times 2}{28} =$$

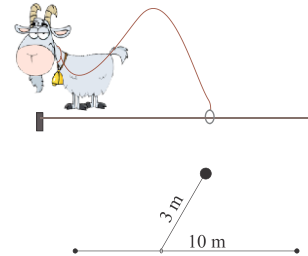
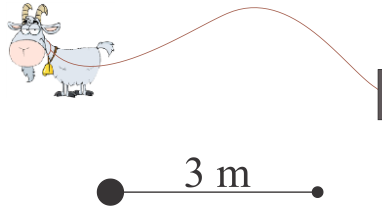
$$\frac{8 \times 8 + 8 \times 7}{8 \times 5} =$$

$$\frac{19 \times 8 + 19 \times 6}{38} =$$

5. There are three short stories in a book. Paulina read the first story in $\frac{1}{3}$ of one hour. She spent $\frac{1}{6}$ of an hour more reading the second story than reading the first one. The third story she read in $\frac{7}{12}$ of an hour less than the two previous stories together. How much time did it take her to read this book?

Geometry.

Draw the picture of what shape will be left on the meadow? Use compass and ruler.
Draw to scale 1 cm for 1 m.



What will be the shape if the goat is attached to the frame like on picture below?

