

## UNIT 4. FRACTIONS

### 1. WHAT ARE FRACTIONS?

Fractions are numbers for counting PART of something.

A **fraction** is written as two whole numbers, one above the other, separated by a horizontal line.

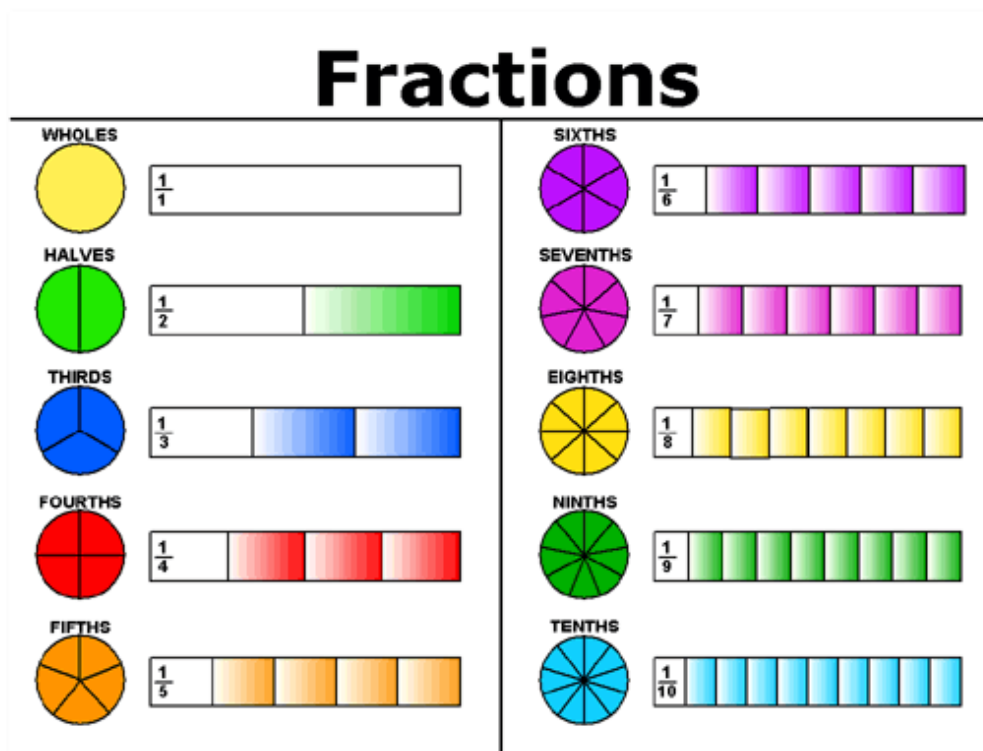
$$\frac{1}{6}$$

← The top number is called the numerator.

← The bottom number is called the denominator.

We read this as "one sixth."

A fraction is a part of an entire object.



- Fraction as an operator:** to calculate a fraction of a number, divide the number by the denominator and multiply the result by the numerator.

$$\frac{3}{5} \text{ of } 30 = 30 \div 5 \cdot 3 = 6 \cdot 3 = 18$$

- Types of fractions:

*Proper fraction*: if the numerator is smaller than the denominator, and is less than 1, for example  $\frac{1}{2}$ .

*Improper fraction*: if the numerator is bigger than the denominator, and is greater than 1, for example  $\frac{5}{3}$ .

- Equivalent Fractions:

You know,  $\frac{1}{2}$  is the same amount as  $\frac{3}{6}$ , so

$$\frac{1}{2} = \frac{3}{6}$$

These are called equivalent fractions. (Because they are equal amounts.)

Here's a quick trick to see if two fractions are equivalent:

$$\begin{array}{c} \cancel{\frac{3}{5} = \frac{39}{65}} \\ 3 \times 65 = 5 \times 39 \\ 195 = 195 \end{array}$$

Example: Does  $\frac{3}{5} = \frac{39}{65}$ ? We use a trick called cross-multiplication:

We get the same result on both sides...

So,  $\frac{3}{5} = \frac{39}{65}$  !

- Simplifying Fractions:

Example: Let's reduce  $\frac{27}{108}$ . So, let's divide it!  $\frac{27 \div 3}{108 \div 3} = \frac{9}{36}$

Hey, now it's easy! Do you see that 9 goes in?

$$\frac{9 \div 9}{36 \div 9} = \frac{1}{4} \quad \text{so} \quad \frac{27}{108} = \frac{1}{4} \text{ is the lowest term.}$$



- **Inverse fraction:**

Inverse fraction of another fraction is when you change denominator for numerator with the same sign.

Example: The inverse fraction of  $\frac{3}{4}$  is  $\frac{4}{3}$ .

The inverse fraction of  $-\frac{2}{5}$  is .....

- **Opposite fraction:**

Opposite fraction of another fraction is when you change its sign.

Example: The opposite fraction of  $\frac{2}{3}$  is  $-\frac{2}{3}$ .

The opposite fraction of  $-\frac{2}{5}$  is  $\frac{2}{5}$ .

## **2. OPERATIONS WITH FRACTIONS.**

Let's revise how to do operations with fractions.

### **2.1. ADD AND SUBTRACT FRACTIONS**

**When the denominators are the same.** Easy! Try it alone! Write one example!

**When the denominators are different.**

Let's try this:  $\frac{1}{2} + \frac{1}{3}$

The main rule of this game is that we can't do anything until the denominators are the same!

We need to find something called the least common denominator (LCD)... It's really just the LCM of our denominators, 2 and 3.

The LCM of 2 and 3 is 6. So, our LCD is 6.

We need to make this our new denominator...



Change the  $\frac{1}{2}$ :  $\frac{1 \times 3}{2 \times 3} = \frac{3}{6}$

Change the  $\frac{1}{3}$ :  $\frac{1 \times 2}{3 \times 2} = \frac{2}{6}$

So  $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6}$  Now we can do it!  $\frac{3+2}{6} = \frac{5}{6}$

*Summing up:*

How to add or subtract fractions with different denominators:

- 1°. Find the Least Common Denominator (LCD) of the fractions
- 2°. Rename the fractions to have the LCD
- 3°. Add or subtract the numerators of the fractions
- 4°. Simplify the Fraction

## 2.2. How to Multiply Fractions.

This is easy!

We just multiply straight across...

$$\frac{1}{3} \times \frac{9}{10} = \frac{1 \times 9}{3 \times 10} = \frac{9}{30} = \frac{9 \div 3}{30 \div 3} = \frac{3}{10}$$

Then just reduce it

## 2.3. How to Divide Fractions.

This is easy too, we just do cross-multiplication...

$$\frac{1}{3} \div \frac{4}{5} = \frac{1 \times 5}{3 \times 4} = \frac{5}{12}$$



## 2.4. Powers of Fractions.

Simply multiply the numerator and the denominator by themselves as many times as the power (exponent) indicates.

$$\left(\frac{3}{5}\right)^2 = \frac{9}{25}$$

### 2.4.1. Order of operations.

The order of operations for fractions is the same as that for natural numbers or integers.

Remember: BODMAS.

B = Brackets.

O = Orders (Exponents or indices)

DM = Multiplication and division.

AS = Addition and subtraction.

If you want to learn this rule with a song, please visit this video:

<http://www.youtube.com/watch?v=TMTESTKAjPg>

## EXERCISES

1. Calculate:

- a)  $\frac{2}{3}$  of 18 =
- b)  $\frac{4}{7}$  of 35 =
- c)  $\frac{3}{8}$  of 80 =
- d)  $\frac{7}{5}$  of 135 =

2. Compare the following fractions:  $\frac{2}{3}$ ,  $\frac{23}{4}$ ,  $\frac{5}{5}$ .

3. Draw the following numbers on the real line:  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $\frac{7}{3}$ ,  $\frac{11}{4}$ ,  $\frac{7}{2}$ ,  $\frac{14}{3}$ .

4. Calculate in your mind:

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

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

c)  $2 \cdot \frac{3}{5}$



5. Calculate the inverse fraction and the opposite fraction of:

$$\frac{2}{3}, -\frac{4}{5}, \frac{1}{2}, -\frac{1}{3}$$

6. Work out:

a)  $\frac{1}{3} - \frac{5}{6} + \frac{3}{2}$

b)  $\frac{7}{9} + \frac{11}{12} - \frac{5}{6}$

c)  $\frac{3}{8} - 2 + \frac{5}{6}$

d)  $\frac{2}{35} + \frac{8}{7} - \frac{3}{10}$

7. Work out:

a)  $\frac{2}{9} \cdot \frac{15}{4}$

b)  $5 \cdot \frac{3}{25}$

c)  $\frac{7}{12} : \frac{3}{4}$

8. Work out:

a)  $3 - \left( \frac{1}{4} + \frac{5}{3} \right)$

b)  $1 - \left( \frac{3}{2} - \frac{7}{5} \right)$

c)  $\frac{2}{3} \cdot \left( \frac{1}{3} + \frac{4}{9} \right)$



d)  $\left(\frac{1}{2} - \frac{3}{8}\right) : \frac{3}{4}$

9. 40 students joined the soccer club.  $\frac{5}{8}$  of the students were boys. How many girls joined the soccer club?
10. Kelly had \$24. She spent  $\frac{5}{6}$  of her money on a book. How much money did Kelly have left?
11. Anna bought some stickers. She gave 9 stickers to her sister. Anna then had  $\frac{3}{4}$  of her stickers left. How many stickers had Anna bought at first?
12. Danny spent  $\frac{1}{5}$  of his money on comic books. The comic books cost \$7 altogether. How much money did Danny have left?
13. Lori used  $\frac{1}{4}$  of her rubberbands in a project. She had 27 rubberbands left. How many rubberbands did Lori use in her project?



14. Marcus had \$450.  
He spent  $\frac{2}{5}$  of it on a DVD player.  
He then spent  $\frac{1}{3}$  of the remaining money on a jacket.  
How much money did Marcus have left?
15. The teen club had a cupcake sale.  
They sold  $\frac{2}{3}$  of their cupcakes in the morning.  
They sold  $\frac{1}{6}$  of their cupcakes in the afternoon.  
They sold 200 cupcakes altogether.  
How many cupcakes were left to sell?
16. Chef Pillsbury purchased some eggs.  
He used  $\frac{1}{2}$  of them to make some pies.  
He used  $\frac{1}{4}$  of the remaining eggs to make a cake.  
He then had 15 eggs left.  
How many eggs had Chef Pillsbury purchased?
17. Leanne bought a bag of marbles.  
 $\frac{3}{8}$  of the marbles were green.  
 $\frac{1}{5}$  of the remaining marbles were red.  
If there were 6 red marbles, how many marbles were in the bag altogether?



18. Kara read 20 pages of her new book on Saturday.  
She read  $\frac{1}{4}$  of the remaining pages on Sunday.  
She still has 36 pages to read.  
How many pages are in Kara's book?

19. Calculate.

a)  $\left(\frac{2}{5} - 1\right) \cdot \frac{5}{3}$

b)  $\left(\frac{4}{5} - 2\right) \cdot \left(\frac{7}{4} - \frac{5}{6}\right)$

c)  $\left(\frac{4}{3} - 2\right) \cdot \frac{3}{10}$

d)  $\left(2 - \frac{7}{6}\right) \cdot \left(4 - \frac{7}{3}\right)$



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Solutions: a) -1                      b) -11/10                      c) -1 / 5                      d) 25 /18

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20. Work out:

a)  $\frac{1}{4} + 5 - \left(\frac{5}{8} + \frac{3}{2}\right)$

b)  $3 - \left(\frac{5}{6} - 2\right) + \frac{2}{3}$

c)  $\frac{1}{2} : \left(\frac{2}{5} - \frac{3}{10}\right)$

d)  $3 - \left(\frac{5}{2} - \frac{7}{4}\right) : \frac{3}{2}$

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Solutions: a) 25/8                      b) 29/6                      c) 5                      d) 5/2

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IT;**



<http://www.mathplayground.com/wpdatabase/wpindex.html>