



Douglas College

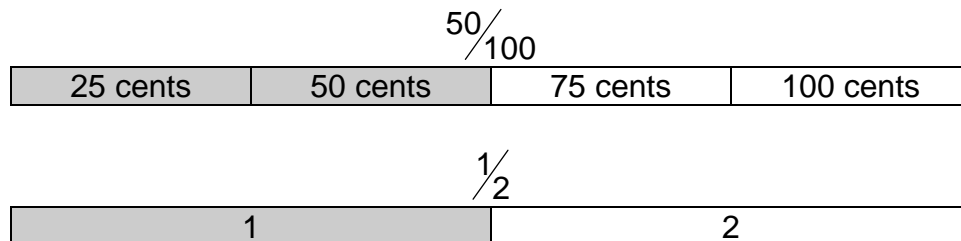
Douglas College Learning Centre

REDUCING FRACTIONS

To use this worksheet, you should first be comfortable with factoring. If you aren't, please refer to the handout Factoring, Prime Numbers and Prime Factorization.

Fractions that are reduced are often much easier to understand and work with. For example, $\frac{30}{60}$ or $\frac{82}{164}$ may not seem related, but after these fractions are reduced we find that they are both equal to $\frac{1}{2}$, a fraction that everyone is familiar with and able to understand.

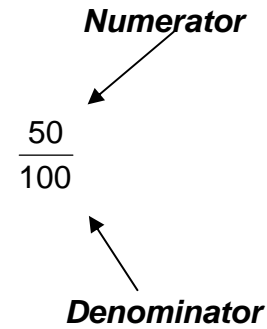
You may feel that reducing fractions is difficult, but you shouldn't worry; you may not know it but you can already do it. What's half of one dollar? If you're thinking it's 50 cents, whether you're aware of it or not, you just equated $\frac{1}{2}$ to $\frac{50}{100}$. You used the same mathematical steps you would use to reduce a fraction!



Note that the proportion of shaded areas in both of the above columns is the same.

$$\frac{50}{100} = \frac{1}{2}$$

When you reduce a fraction, you are renaming it by using a smaller *numerator*, the number on the top, and *denominator*, the number on the bottom. You do this by eliminating all the common factors between the fraction's numerator and denominator. Often, reducing a fraction involves simplifying it to its *lowest terms*, the point when the numerator and denominator cannot be further reduced because they have no common factors.



To reduce $\frac{50}{100}$, we first determine that the numerator and denominator have a common factor of 50. By dividing both the numerator and denominator by 50, we reduce $\frac{50}{100}$ to $\frac{1}{2}$. Because the numerator and denominator in $\frac{1}{2}$ do not share a common factor (apart from 1), the fraction has been reduced to its lowest terms.

Using Prime Factored Form to Reduce a Fraction:

To reduce a fraction to its lowest terms:

Step 1: Break up the numerator and denominator into prime-factored form. (If you don't know how this is done, please see the handout titled *Factoring, Prime Numbers and Prime Factorization*.)

Step 2: Divide the numerator and denominator by the common prime factors.

Step 3: Multiply the factors that are left back together.

Example 1)
$$\frac{120}{210} = \frac{2 \times 3 \times 3 \times 7}{2 \times 3 \times 5 \times 7} = \frac{3}{5}$$

Example 2)
$$\frac{396}{2310} = \frac{2 \times 2 \times 3 \times 3 \times 11}{2 \times 3 \times 5 \times 7 \times 11} = \frac{2 \times 3}{5 \times 7} = \frac{6}{35}$$

Now try some on your own.

Exercise 1: Converting to Prime Factored Form to Reduce a Fraction

Reduce to lowest terms. See the last page for answers.

1) $\frac{6}{12}$

2) $\frac{30}{50}$

3) $\frac{32}{40}$

4) $\frac{99}{133}$

5) $\frac{96}{126}$

6) $\frac{600}{800}$

7) $\frac{525}{1125}$

8) $\frac{504}{1764}$

Reducing Fractions in Word Problems:

Suppose that everyday you eat your lunch at a stand that charges ¢90 for a hotdog. One day you find that a new stand has opened, and it charges ¢60 for the same kind of hotdog. How much of the total money you normally spend on hotdogs will you save by switching to the new stand? Express your answers as a fraction reduced to lowest terms.

For the problem above, we know that by switching stands you will save ¢30 for every hotdog that you would normally have spent ¢90 on. So we can set up a fraction:

$$\frac{30 \text{ cents saved}}{90 \text{ cents you would normally spend}}$$

Now we reduce this fraction by eliminating all the common prime factors between the numerator, 30, and the denominator, 90.

$$\frac{30}{90} = \frac{2 \times 3 \times 5}{2 \times 3 \times 3 \times 5} = \frac{1}{3}$$

By dividing 2, 3 and 5 out of both the numerator and denominator, we get $\frac{1}{3}$. The new numerator and denominator no longer have a common factor (apart from 1) so we have reached the fraction's lowest terms and have our answer. By switching hotdog stands, you will save $\frac{1}{3}$ of your lunch money.

Now try a few word problems.

Exercise 2: Word Problems

- 1) Mojo Jojo loves bananas. Yesterday he bought 5 boxes that contained 2 dozen bananas each, and today he has only 15 left. What fraction of his bananas did he eat? Reduce to lowest terms.
- 2) Bubbles uses up 5 crayons on every picture she draws. If she starts with a box of 100 crayons and draws 8 pictures, what fraction of her box of crayons will she have left? Reduce to lowest terms.

Answers

Exercise 1

- 1) $\frac{1}{2}$
- 2) $\frac{3}{5}$
- 3) $\frac{4}{5}$
- 4) $\frac{3}{4}$
- 5) $\frac{16}{21}$
- 6) $\frac{3}{4}$
- 7) $\frac{7}{15}$
- 8) $\frac{2}{7}$

Exercise 2

- 9) $\frac{7}{8}$
- 10) $\frac{3}{5}$