

2

USO

4

Fractions

Study Support

USQ Library



Overview

This presentation will cover:

- ► Fraction definitions;
- ► Equivalent fractions;
- ► Mixed numbers and improper fractions;
- Addition and subtraction of fractions;
- Multiplication of fractions; and
- ► Division of fractions.



1

Fraction Definitions

- A fraction represents a part of a whole or, more generally, any number of equal parts.
- The **denominator** (the number on the bottom of the fraction) tells us how many parts the object is divided into.
- The numerator (the part on the top of the fraction) tells us how many of these parts we have.
- ► An improper fraction is a fraction where the numerator is larger than the denominator, for example, ³/₂.
- A mixed number has a whole number with a fraction, for example $1\frac{1}{2}$.

Equivalent fractions

 $\frac{1}{2}$ is equivalent to $\frac{2}{4}$.

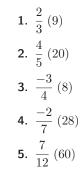
simplest form.



Equivalent fractions: Exercise



Write equivalent fraction for each of the following by making the new denominator the number given in the brackets.



Equivalent fractions: Answers

1.	$\frac{2}{3} = \frac{2\times3}{3\times3} = \frac{6}{9} .$	
2.	$\frac{4}{5} = \frac{4 \times 4}{5 \times 4} = \frac{16}{20} .$	
3.	$\frac{-3}{4} = \frac{-3 \times 2}{4 \times 2} = \frac{-6}{8}.$	
4.	$\frac{-2}{7} = \frac{-2 \times 4}{7 \times 4} = \frac{-8}{28} .$	
5.	$\frac{7}{12} = \frac{7 \times 5}{12 \times 5} = \frac{35}{60} .$	

Equivalent fractions have different names for the same value, for example

• The process of dividing the numerator and denominator by the same number is called simplifying fractions, for example $\frac{6}{12}$ is equivalent to $\frac{1}{2}$, which is in

▶ Equivalent fractions can be made by multiplying or dividing both the

numerator and the denominator by the same number.

VUSO

5

Equivalent fractions: exercise

1. $\frac{9}{15}$

2. $\frac{-3}{18}$

3. $\frac{8}{10}$

4. $\frac{-12}{16}$

5. $\frac{30}{40}$

6. $\frac{2\,000}{6\,000}$



8

Simplify the following fractions, giving your answer in its simplest form.

Equivalent fractions: Answers

1. Dividing by 3:

 $\frac{9}{15} = \frac{\cancel{9}^3}{\cancel{15}^5} = \frac{3}{5}.$

2. Dividing by 3:

$$\frac{-3}{18} = \frac{-3^{-1}}{18^6} = \frac{-1}{6}.$$

3. Dividing by 2:

$$\frac{8}{10} = \frac{8^4}{10^5} = \frac{4}{5}.$$

4. Dividing by 4:

$$\frac{-12}{16} = \frac{-12^{-3}}{16^{4}} = \frac{-3}{4}$$

Mixed numbers and improper fractions

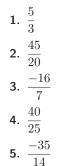
- **V**USQ
- **5.** We are dividing by 10 but in practice we just cancel the zeros:

$$\frac{30}{40} = \frac{30}{40} = \frac{3}{4}$$

- **6**. Cancel 3 zeros on the top and 3 zeros on the bottom:
- $\frac{2,000}{6,000} = \frac{2,000}{6,000} = \frac{2}{6} \frac{1}{3} = \frac{1}{3}$

Mixed numbers and improper fractions

Express these improper fractions as mixed numbers.



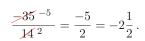
USQ Mixed numbers and improper fractions

9

 $\frac{5}{3} = 1\frac{2}{3}$. 2. $\frac{45^9}{20^4} = \frac{9}{4} = 2\frac{1}{4}.$ 3. $\frac{-16}{7} = -2\frac{2}{7}$.

4.

1.



 $\frac{40^8}{25^5} = \frac{8}{5} = 1\frac{3}{5}.$

Express these mixed numbers as improper fractions.

1.
$$3\frac{1}{4}$$

2. $9\frac{2}{11}$
3. $-5\frac{2}{3}$
4. $102\frac{5}{12}$
5. $-21\frac{2}{5}$



10

USO

Mixed numbers and improper fractions

1. $3\frac{1}{4} = \frac{3 \times 4 + 1}{4} = \frac{13}{4}.$ 2. $9\frac{2}{11} = \frac{9 \times 11 + 2}{11} = \frac{101}{11}.$ 3. $-5\frac{2}{3} = -\left(\frac{5 \times 3 + 2}{3}\right) = -\frac{17}{3}.$ 4. $102\frac{5}{12} = \frac{102 \times 12 + 5}{12} = \frac{1,229}{12}.$ 5. $-21\frac{2}{5} = -\left(\frac{21 \times 5 + 2}{5}\right) = -\frac{107}{5}.$



Addition and Subtraction of Fractions



- ▶ To add or subtract fractions they need to have the same denominator.
- ▶ Remember that fractions should always be left in lowest form.
- When adding mixed numbers (whole number with a fraction), you add the whole numbers, then the fractions.
- When subtracting mixed numbers, convert to improper fractions, before doing the subtraction.

Adding fractions: Example

For example:

 $\frac{2}{5} + \frac{3}{8}$ find the common denominator: $5 \times 8 = 40$, $= \frac{2 \times 8}{5 \times 8} + \frac{3 \times 5}{8 \times 5}$ $= \frac{16}{40} + \frac{15}{40}$ $= \frac{16 + 15}{40}$ $= \frac{31}{40}$, remember to check if it is in simplest form. Yes it is.

WUSQ

13

Addition of fraction: mixed number example



14

$$3\frac{2}{5} + 2\frac{3}{8} = \frac{17}{5} + \frac{19}{8}$$

= $\left(\frac{17}{5} \times \frac{8}{8}\right) + \left(\frac{19}{8} \times \frac{5}{5}\right)$
= $\frac{136}{40} + \frac{95}{40}$
= $\frac{231}{40}$
= $5\frac{31}{40}$.

Subtraction of fractions: example

WUSQ



Calculate:

Find the lowest common denominator: 18.

Now calculate:

$$\frac{1}{6} - \frac{7}{9} = \left(\frac{1}{6} \times \frac{3}{3}\right) - \left(\frac{7}{9} \times \frac{2}{2}\right)$$
$$= \frac{3}{18} - \frac{14}{18}$$
$$= \frac{3 - 14}{18}$$
$$= -\frac{11}{18}.$$

 $\frac{1}{6}-\frac{7}{9}$

► To multiply to fractions, multiply the numerators and the denominators.

- Common factors can be cancelled either during the multiplication or at the end to give answer in simplest form.
- ► To multiply mixed numbers, convert them to improper fractions first.

Fractions — Multiplication and division



17

Multiplication of fractions: example



18

Calculate:

1.
$$\frac{7}{8} \times \frac{16}{21}$$
;
2. $-3\frac{1}{3} \times -7\frac{1}{2}$.

For example:

$$\frac{7}{8} \times \frac{16}{21} = \frac{7 \times 16}{8 \times 21}$$
$$= \frac{7^{1} \times 16^{2}}{8^{1} \times 21^{3}}$$
$$= \frac{1 \times 2}{1 \times 3}$$
$$= \frac{2}{3}.$$

Multiplication of fractions: example





 $-3\frac{1}{3} \times -7\frac{1}{2} = -\frac{10}{3} \times -\frac{15}{2}$ $= -\frac{10}{3} \times -\frac{15}{2}$ $= -\frac{10}{3} \times -\frac{15}{2}$ $= -\frac{10}{3} \times -\frac{15}{2}$ $= -\frac{5}{3} \times -\frac{15}{1}$ $= -\frac{5}{1} \times -\frac{15}{1}$ = -25.

- Dividing by a fraction is the same as multiplying by its reciprocal (fraction turned upside down);
- If dividing with mixed numbers, remember to convert to improper fractions first.

21

Division of fractions: example

$$\frac{\frac{3}{4} \div \frac{2}{3}}{\frac{4}{2}} = \frac{\frac{3}{4} \times \frac{3}{2}}{\frac{3 \times 3}{4 \times 2}}$$
$$= \frac{\frac{3}{4} \times \frac{3}{2}}{\frac{9}{8}}$$
$$= 1\frac{1}{8}.$$



Exercise

Evaluate the following without a calculator.

1.
$$\frac{3}{4} \div \frac{9}{20}$$

2. $-\frac{21}{25} \div \frac{35}{30}$
3. $4\frac{2}{5} \div 2\frac{7}{10}$
4. $7\frac{5}{8} \div -3\frac{1}{2}$
5. $-2\frac{1}{4} \div -\frac{3}{8}$

Check your answers on the calculator.









1.

$$\frac{3}{4} \div \frac{9}{20} = \frac{3}{4} \times \frac{20}{9}$$
$$= \frac{3}{4} \times \frac{20}{9}^{5}$$
$$= \frac{3}{4} \times \frac{20}{9}^{5}$$
$$= \frac{1 \times 5}{1 \times 3}$$
$$= \frac{5}{3}$$
$$= 1\frac{2}{3}.$$

2.

$$\frac{-21}{25} \div \frac{35}{30} = \frac{-21}{25} \times \frac{30}{35}$$
$$= \frac{-21}{25} \times \frac{30}{35}$$
$$= \frac{-21}{25} \times \frac{30}{35}^{6}$$
$$= \frac{-3 \times 6}{25}$$
$$= -\frac{18}{25}.$$

26

Answers (cont)

3.

$$4\frac{2}{5} \div 2\frac{7}{10} = \frac{22}{5} \div \frac{27}{10}$$
$$= \frac{22}{5} \times \frac{10}{27}$$
$$= \frac{22 \times 10^2}{5^1 \times 27}$$
$$= \frac{22 \times 2}{1 \times 27}$$
$$= \frac{44}{27}$$
$$= 1\frac{17}{27}.$$

25

WUSQ Answers (cont)

4.



$$7\frac{5}{8} \div -3\frac{1}{2} = \frac{61}{8} \div \frac{-7}{2}$$
$$= \frac{61}{8} \times \frac{-2}{7}$$
$$= \frac{61 \times -2^{-1}}{8^{4} \times 7}$$
$$= \frac{61 \times -1}{4 \times 7}$$
$$= \frac{-61}{28}$$
$$= -2\frac{5}{28}.$$

Answers (cont)



29

5.

$$-2\frac{1}{4} \div \frac{-3}{8} = \frac{-9}{4} \div \frac{-3}{8}$$
$$= \frac{-9}{4} \times \frac{-8}{3}$$
$$= \frac{-9^{-3} \times -8^{-2}}{4^{1} \times 3^{1}}$$
$$= \frac{-3 \times -2}{1 \times 1}$$
$$= 6.$$

