

FRACTIONS MODULE

Part II

I. Multiplying Fractions

II. Dividing Fractions

III. Adding Fractions

IV. Subtracting Fractions

I. Multiplying Fractions.

Introduction: This is the first of four parts on solving with fraction problems. You're going to look at an example on how to multiply fractions. Afterwards, you're going to try to do some problems on your own. There will be 20 problems for you to practice. After you're successful in doing the practice problems, try the short quiz. The answers can be found at the end of each section.

FIRST RULE OF MULTIPLYING, DIVIDING, ADDING & SUBTRACTING FRACTIONS:

CHANGE ALL MIXED NUMBERS INTO IMPROPER FRACTIONS.

A) **Example:** Multiply the following fractions:

$$\left(\frac{7}{8}\right)\left(2\frac{3}{14}\right)$$

STEP 1: Change all mixed numbers to improper fractions

$$2\frac{3}{14} = \frac{31}{14}$$

STEP 2: Rewrite the multiplication problem.

$$\frac{7}{8} \cdot \frac{31}{14}$$

STEP 3: Multiply straight across.

$$\frac{217}{112}$$

STEP 4: Reduce the fraction.

$$\frac{217 \div 7}{112 \div 7}$$

$$\frac{31}{16}$$

SHORT CUT: CROSS CANCEL

On Step 2, look at the diagonal of the fractions: 7 and 14.

$$\frac{7}{8} \cdot \frac{31}{14}$$

What number can go into both numbers? 7

$$\frac{7 \div 7}{8} \cdot \frac{31}{14 \div 7}$$

$$\frac{1}{8} \cdot \frac{31}{2}$$

Then multiply straight across.

$$\frac{31}{16}$$

⇒ SECOND RULE OF MULTIPLYING, DIVIDING, ADDING & SUBTRACTING FRACTIONS:

MULTIPLY STRAIGHT ACROSS.

B) You Try:

a) $\left(\frac{5}{3}\right)\left(\frac{18}{25}\right)$

b) $2\frac{3}{5} \cdot 3\frac{1}{2}$

Answers to B “You Try”:

a) $\frac{6}{5}$ or $1\frac{1}{5}$

b) $\frac{91}{10}$ or $9\frac{1}{10}$

C) PRACTICE PROBLEMS.

Multiply the following problems:

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

2) $\left(\frac{2}{3}\right)\left(\frac{1}{2}\right)$

3) $1\frac{3}{5} \cdot \frac{1}{2}$

4) $\left(\frac{1}{5}\right)\left(\frac{3}{7}\right)$

5) $\frac{3}{5} \cdot 3\frac{1}{2}$

6) $\left(\frac{3}{4}\right)\left(\frac{1}{6}\right)$

7) $1\frac{3}{5} \cdot 1\frac{1}{2}$

8) $1\frac{1}{4} \cdot 1\frac{2}{3}$

9) $\left(\frac{5}{7}\right)\left(\frac{7}{3}\right)$

10) $2\frac{1}{7} \cdot 1\frac{1}{5}$

11) $\left(\frac{2}{3}\right)\left(\frac{1}{4}\right)$

12) $1\frac{3}{5} \cdot 3\frac{3}{4}$

13) $\frac{2}{1} \cdot 5\frac{1}{2}$

14) $\left(\frac{2}{5}\right)\left(\frac{25}{18}\right)$

15) $\frac{3}{5} \cdot \frac{15}{6}$

16) $\left(\frac{3}{8}\right)\left(\frac{18}{21}\right)$

17) $2\frac{3}{4} \cdot 3\frac{5}{9}$

18) $\left(\frac{8}{9}\right)\left(\frac{72}{16}\right)$

19) $1\frac{2}{9} \cdot 4\frac{1}{2}$

20) $\left(\frac{25}{18}\right)\left(\frac{18}{25}\right)$

Answers to C "Practice Problems": 1) $\frac{2}{15}$; 2) $\frac{1}{3}$; 3) $\frac{4}{15}$; 4) $\frac{1}{3}$; 5) $\frac{21}{10} = 2\frac{1}{10}$; 6) $\frac{1}{8}$; 7) $\frac{12}{5} = 2\frac{2}{5}$; 8) $\frac{25}{12} = 2\frac{1}{12}$; 9) $\frac{5}{3} = 1\frac{2}{3}$; 10) $\frac{18}{7} = 2\frac{4}{7}$; 11) $\frac{1}{6}$; 12) 6; 13) 11; 14) $\frac{5}{9}$; 15) $\frac{3}{2} = 1\frac{1}{2}$; 16) $\frac{9}{28}$; 17) $\frac{88}{9} = 9\frac{7}{9}$; 18) 4; 19) $\frac{11}{2} = 5\frac{1}{2}$; 20) 1

D) QUIZ.

Multiply:

1) $\left(\frac{3}{4}\right)\left(\frac{1}{6}\right)$

2) $\left(\frac{25}{18}\right)\left(\frac{18}{25}\right)$

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

4) $1\frac{2}{9} \cdot 4\frac{1}{2}$

5) $2\frac{3}{4} \cdot 3\frac{5}{9}$

Answers to D "Quiz": 1) $\frac{1}{8}$; 2) 1; 3) $\frac{3}{35}$; 4) $\frac{11}{2} = 5\frac{1}{2}$; 5) $\frac{88}{9} = 9\frac{7}{9}$

II. Dividing Fractions.

Introduction: This is the second of four parts on solving with fraction problems. You're going to look at an example on how to divide fractions. Afterwards, you're going to try to do some problems on your own. There will be 20 problems for you to practice. After you're successful in doing the practice problems, try the short quiz. The answers can be found at the end of each section.

FIRST RULE OF MULTIPLYING, DIVIDING, ADDING & SUBTRACTING FRACTIONS:

CHANGE ALL MIXED NUMBERS INTO IMPROPER FRACTIONS.

A) **Example:** Divide the following fractions:

$$\left(\frac{7}{8}\right) \div \left(2\frac{3}{14}\right)$$

STEP 1: Change all mixed numbers to improper fractions

$$2\frac{3}{14} = \frac{31}{14}$$

STEP 2: Rewrite the division problem.

$$\frac{7}{8} \div \frac{31}{14}$$

STEP 3: Take the reciprocal of the second fraction to change division into a multiplication.

$$\frac{7}{8} \cdot \frac{14}{31}$$

STEP 4: Multiply straight across.

$$\frac{98}{248}$$

STEP 4: Reduce the fraction.

$$\frac{98 \div 2}{248 \div 2}$$

$$\frac{49}{124}$$

SHORT CUT: CROSS CANCEL

On Step 3, look at the diagonal of the fractions: 8 and 14.

$$\frac{7}{8} \cdot \frac{14}{31}$$

What number can go into both numbers? 2

$$\frac{7}{8 \div 2} \cdot \frac{14 \div 2}{31}$$

$$\frac{7}{4} \cdot \frac{7}{31}$$

Then multiply straight across.

$$\frac{49}{124}$$

THIRD RULE OF MULTIPLYING, DIVIDING, ADDING & SUBTRACTING FRACTIONS:

CHANGE DIVISION TO MULTIPLICATION BY TAKING THE RECIPROCAL OF THE SECOND FRACTION.

B) You Try:

a) $\left(\frac{5}{3}\right) \div \left(\frac{9}{5}\right)$

b) $2\frac{3}{5} \div 3\frac{1}{2}$

Answers to B "You Try":

a) $\frac{25}{27}$

b) $\frac{36}{35} = 1\frac{1}{35}$

C) PRACTICE PROBLEMS.

Divide the following problems:

$$1) \frac{1}{3} \div \frac{2}{5}$$

$$2) \frac{2}{3} \div \frac{1}{2}$$

$$3) 1\frac{3}{5} \div \frac{1}{2}$$

$$4) \frac{1}{5} \div \frac{3}{7}$$

$$5) \frac{3}{5} \div 3\frac{1}{2}$$

$$6) \frac{3}{4} \div \frac{1}{6}$$

$$7) 1\frac{3}{5} \div 1\frac{1}{2}$$

$$8) 1\frac{1}{4} \div 1\frac{2}{3}$$

$$9) \frac{5}{7} \div \frac{7}{3}$$

$$10) 2\frac{1}{7} \div 1\frac{1}{5}$$

$$11) \frac{2}{3} \div \frac{1}{4}$$

$$12) 1\frac{3}{5} \div 3\frac{3}{4}$$

$$13) \frac{2}{1} \div 5\frac{1}{2}$$

$$14) \frac{2}{5} \div \frac{5}{8}$$

$$15) \frac{3}{5} \div \frac{15}{6}$$

$$16) \frac{3}{8} \div \frac{18}{21}$$

$$17) 2\frac{3}{4} \div 3\frac{1}{5}$$

$$18) \frac{8}{9} \div \frac{7}{6}$$

$$19) 1\frac{2}{9} \div 4\frac{1}{2}$$

$$20) \frac{5}{8} \div \frac{8}{5}$$

Answers to C "Practice Problems": 1) $\frac{5}{6}$; 2) $\frac{4}{3} = 1\frac{1}{3}$; 3) $\frac{16}{5} = 3\frac{1}{5}$; 4) $\frac{7}{15}$; 5) $\frac{6}{35}$; 6) $\frac{9}{2} = 4\frac{1}{2}$; 7) $\frac{16}{15} = 1\frac{1}{15}$; 8) $\frac{3}{4}$; 9) $\frac{15}{49}$; 10) $\frac{25}{14} = 1\frac{11}{14}$; 11) $\frac{8}{3} = 2\frac{2}{3}$; 12) $\frac{32}{75}$; 13) $\frac{4}{11}$; 14) $\frac{16}{25}$; 15) $\frac{6}{25}$; 16) $\frac{21}{48}$; 17) $\frac{35}{64}$; 18) $\frac{16}{21}$; 19) $\frac{22}{81}$; 20) 1

D) QUIZ.

Divide:

1) $\frac{3}{4} \div \frac{1}{6}$

2) $\frac{25}{18} \div \frac{5}{6}$

3) $\frac{1}{5} \div \frac{3}{7}$

4) $1\frac{2}{9} \div 4\frac{1}{2}$

5) $2\frac{3}{4} \div 3\frac{1}{5}$

Answers to D “Quiz”: 1) $\frac{9}{2} = 4\frac{1}{2}$; 2) $\frac{5}{3} = 1\frac{2}{3}$; 3) $\frac{7}{15}$; 4) $\frac{22}{81}$; 5) $\frac{55}{64}$

III. Adding Fractions.

Introduction: This is the third of four parts on solving problems with fractions. First, review your times table skills. Then we're going to look at an example on how to add fractions. Afterwards, you're going to try to do some problems on your own. There will be 20 problems for you to practice. After you're successful in doing the practice problems, try the short quiz. The answers can be found at the end of each section.

FIRST RULE OF MULTIPLYING, DIVIDING, ADDING & SUBTRACTING FRACTIONS:

CHANGE ALL MIXED NUMBERS INTO IMPROPER FRACTIONS.

A) **Example:** Add the following fractions:

$$\frac{3}{4} + \frac{1}{2}$$

STEP 1: Change all mixed numbers to improper fractions

All fractions are proper. Therefore, you do not have to do anything.

STEP 3: Write down the multiples of each denominator to find the lowest common multiple.

4, 8, 12, 16 ...

2, 4, 6, 8, 10 ...

Lowest Common Multiple: 4

STEP 4: Multiply the first fraction by $\frac{1}{1}$. Multiply straight across.

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

$$\frac{3}{4}$$

STEP 5: Multiply the first fraction by $\frac{2}{2}$. Multiply straight across.

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

$$\frac{2}{4}$$

STEP 6: Rewrite the addition problem.

$$\frac{3}{4} + \frac{2}{4}$$

STEP 7: Add the numerators and put the difference over the original denominator.

$$\frac{5}{4}$$

Or in mixed number format

$$1\frac{1}{4}$$

B) Example: Add the following fractions:

$$\left(2\frac{3}{14}\right) + \left(\frac{7}{8}\right)$$

STEP 1: Change all mixed numbers to improper fractions

$$2\frac{3}{14} = \frac{31}{14}$$

STEP 2: Rewrite the addition problem.

$$\frac{31}{14} + \frac{7}{8}$$

STEP 3: Write down the multiples of each denominator to find the lowest common multiple.

14, 28, 42, **56**

8, 16, 24, 32, 40, 48, **56**

Lowest Common Multiple: **56**

STEP 4: Multiply the first fraction by $\frac{4}{4}$. Multiply straight across.

$$\frac{31}{14} \cdot \frac{4}{4}$$

$$\frac{124}{56}$$

STEP 5: Multiply the first fraction by $\frac{7}{7}$. Multiply straight across.

$$\frac{7}{8} \cdot \frac{7}{7}$$

$$\frac{49}{56}$$

STEP 6: Rewrite the addition problem.

$$\frac{124}{56} + \frac{49}{56}$$

STEP 6: Add the numerators and put the sum over the original denominator.

$$\frac{173}{56}$$

Or written as a mixed number

$$3\frac{5}{56}$$

FOURTH RULE OF MULTIPLYING, DIVIDING, ADDING & SUBTRACTING FRACTIONS:

TO ADD AND SUBTRACT YOU NEED A COMMON DENOMINATOR. ADD OR SUBTRACT THE NUMERATORS AND PUT THE SUM OR DIFFERENCE OVER THE ORIGINAL DENOMINATOR.

C) You Try:

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

b) $2\frac{4}{5} + 3\frac{1}{2}$

Answers to C "You Try":

a) $\frac{13}{6} = 2\frac{1}{6}$

b) $\frac{63}{10} = 6\frac{3}{10}$

D) PRACTICE PROBLEMS.

Add the following problems:

$$1) \frac{1}{5} + \frac{2}{5}$$

$$2) \frac{1}{3} + \frac{1}{2}$$

$$3) 1\frac{3}{5} + \frac{1}{2}$$

$$4) \frac{1}{7} + \frac{3}{7}$$

$$5) \frac{3}{5} + 3\frac{1}{2}$$

$$6) \frac{3}{4} + \frac{1}{6}$$

$$7) 1\frac{3}{4} + 1\frac{1}{2}$$

$$8) 1\frac{1}{4} + 1\frac{2}{4}$$

$$9) \frac{5}{2} + \frac{7}{3}$$

$$10) 2\frac{1}{3} + 1\frac{1}{5}$$

$$11) \frac{2}{3} + \frac{1}{4}$$

$$12) 1\frac{3}{5} + 2\frac{1}{4}$$

$$13) \frac{2}{1} + 5\frac{1}{2}$$

$$14) \frac{2}{5} + \frac{5}{5}$$

$$15) \frac{3}{5} + \frac{1}{6}$$

$$16) \frac{3}{8} + \frac{1}{2}$$

$$17) 2\frac{3}{4} + 3\frac{1}{8}$$

$$18) \frac{8}{9} + \frac{7}{9}$$

$$19) 1\frac{2}{9} + 4\frac{1}{9}$$

$$20) \frac{5}{8} + \frac{8}{5}$$

Answers to D "Practice Problems": 1) $\frac{3}{5}$; 2) $\frac{5}{6}$; 3) $2\frac{1}{10}$; 4) $\frac{4}{7}$; 5) $4\frac{1}{10}$; 6) $\frac{11}{12}$; 7) $2\frac{3}{4}$; 8) $2\frac{3}{4}$; 9) $4\frac{5}{6}$; 10) $3\frac{8}{15}$; 11) $\frac{11}{12}$; 12) $3\frac{3}{4}$; 13) $7\frac{1}{2}$; 14) $1\frac{2}{5}$; 15) $\frac{23}{30}$; 16) $\frac{7}{8}$; 17) $5\frac{7}{8}$; 18) $1\frac{2}{3}$; 19) $5\frac{1}{3}$; 20) $2\frac{15}{40}$

E) QUIZ.

1) $\frac{3}{4} + \frac{1}{6}$

2) $\frac{1}{7} + \frac{3}{7}$

3) $\frac{1}{5} + \frac{3}{7}$

4) $1\frac{2}{9} + 4\frac{1}{9}$

5) $2\frac{3}{4} + 3\frac{1}{8}$

Answers to E "Quiz": 1) $\frac{11}{12}$; 2) $\frac{4}{7}$; 3) $\frac{22}{35}$; 4) $\frac{16}{9} = 5\frac{1}{9}$; 5) $\frac{47}{8} = 5\frac{7}{8}$;

IV. Subtracting Fractions.

Introduction: This is the last of four parts on solving problems with fractions. First, review your times table skills. Then you're going to look at an example on how to subtract fractions. Afterwards, you're going to try to do some problems on your own. There will be 20 problems for you to practice. After you're successful in doing the practice problems, try the short quiz. The answers can be found at the end of each section.

FIRST RULE OF MULTIPLYING, DIVIDING, ADDING & SUBTRACTING FRACTIONS:

CHANGE ALL MIXED NUMBERS INTO IMPROPER FRACTIONS.

A) **Example:** Subtract the following fractions:

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

STEP 1: Change all mixed numbers to improper fractions

All fractions are proper. Therefore, you do not have to do anything.

STEP 3: Write down the multiples of each denominator to find the lowest common multiple.

4, 8, 12, 16 ...

2, 4, 6, 8, 10 ...

Lowest Common Multiple: 4

STEP 4: Multiply the first fraction by $\frac{1}{1}$. Multiply straight across.

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

$$\frac{3}{4}$$

STEP 5: Multiply the first fraction by $\frac{2}{2}$. Multiply straight across.

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

$$\frac{2}{4}$$

STEP 6: Rewrite the subtraction problem.

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

STEP 7: Subtract the numerators and put the difference over the original denominator.

$$\frac{1}{4}$$

B) Example: Subtract the following fractions:

$$\left(2\frac{3}{14}\right) - \left(\frac{7}{8}\right)$$

STEP 1: Change all mixed numbers to improper fractions

$$2\frac{3}{14} = \frac{31}{14}$$

STEP 2: Rewrite the subtraction problem.

$$\frac{31}{14} - \frac{7}{8}$$

STEP 3: Write down the multiples of each denominator to find the lowest common multiple.

14, 28, 42, **56**

8, 16, 24, 32, 40, 48, **56**

Lowest Common Multiple: 56

STEP 4: Multiply the first fraction by $\frac{4}{4}$. Multiply straight across.

$$\frac{31}{14} \cdot \frac{4}{4}$$

$$\frac{124}{56}$$

STEP 5: Multiply the first fraction by $\frac{7}{7}$. Multiply straight across.

$$\frac{7}{8} \cdot \frac{7}{7}$$

$$\frac{49}{56}$$

STEP 6: Rewrite the subtraction problem.

$$\frac{124}{56} - \frac{49}{56}$$

STEP 6: Subtract the numerators and put the difference over the original denominator.

$$\frac{75}{56}$$

Or written as a mixed number

$$1 \frac{19}{56}$$

FOURTH RULE OF MULTIPLYING, DIVIDING, ADDING & SUBTRACTING FRACTIONS:

TO ADD AND SUBTRACT YOU NEED A COMMON DENOMINATOR. ADD OR SUBTRACT THE NUMERATORS AND PUT THE SUM OR DIFFERENCE OVER THE ORIGINAL DENOMINATOR.

C) You Try:

a) $\frac{4}{5} - \frac{2}{5}$

b) $3\frac{2}{3} - 1\frac{1}{6}$

Answers to C "You Try":

a) $\frac{2}{5}$

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

D) PRACTICE PROBLEMS.

Subtract the following problems:

$$1) \frac{2}{5} - \frac{1}{5}$$

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

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

$$4) \frac{7}{8} - \frac{5}{8}$$

$$5) \frac{13}{4} - 1\frac{5}{8}$$

$$6) \frac{3}{4} - \frac{1}{6}$$

$$7) 1\frac{3}{4} - 1\frac{1}{2}$$

$$8) 1\frac{3}{4} - \frac{2}{4}$$

$$9) \frac{5}{2} - \frac{7}{3}$$

$$10) 2\frac{1}{3} - 1\frac{1}{5}$$

$$11) \frac{2}{3} - \frac{1}{4}$$

$$12) 2\frac{1}{4} - 1\frac{3}{5}$$

$$13) 5\frac{1}{2} - \frac{2}{1}$$

$$14) \frac{5}{5} - \frac{2}{5}$$

$$15) \frac{3}{5} - \frac{1}{6}$$

$$16) \frac{1}{2} - \frac{3}{8}$$

$$17) 3\frac{1}{8} - 2\frac{3}{4}$$

$$18) \frac{8}{9} - \frac{7}{9}$$

$$19) 4\frac{1}{9} - 1\frac{2}{9}$$

$$20) \frac{5}{8} - \frac{5}{8}$$

Answers to D "Practice Problems": 1) $\frac{1}{5}$; 2) $\frac{1}{6}$; 3) 3; 4) $\frac{1}{4}$; 5) $\frac{13}{8} = 1\frac{5}{8}$; 6) $\frac{7}{12}$; 7) $\frac{1}{4}$; 8) $\frac{5}{4} = 1\frac{1}{4}$; 9) $\frac{1}{6}$; 10) $\frac{17}{15} = 1\frac{2}{15}$; 11) $\frac{5}{12}$; 12) $\frac{13}{20}$; 13) $\frac{7}{2} = 3\frac{1}{2}$; 14) $\frac{3}{5}$; 15) $\frac{13}{30}$; 16) $\frac{1}{8}$; 17) $\frac{3}{8}$; 18) $\frac{1}{9}$; 19) $\frac{26}{9} = 2\frac{8}{9}$; 20) 0

E) QUIZ.

1) $\frac{8}{9} - \frac{7}{9}$

2) $\frac{5}{8} - \frac{5}{8}$

3) $\frac{3}{4} - \frac{1}{6}$

4) $4\frac{1}{9} - 1\frac{2}{9}$

5) $2\frac{1}{3} - 1\frac{1}{5}$

Answers to E “Quiz”: 1) $\frac{1}{9}$; 2) 0; 3) $\frac{7}{12}$; 4) $\frac{26}{9} = 2\frac{8}{9}$; 5) $\frac{17}{15} = 1\frac{2}{15}$