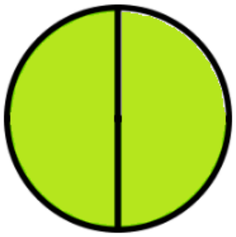
MATH LEVEL 2
LESSON PLAN 4

FRACTIONS

Section 1: Unit & Fractions

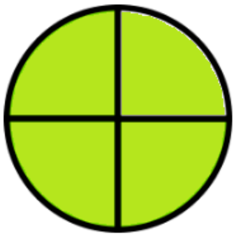
1. The word fraction means “a broken piece”. We use fractions to describe a quantity between 0 and 1.

   We can break a cookie into *two halves, three thirds, four fourths, five fifths, six sixths*, *seven sevenths,* and so on. Hence, when a unit is divided into equal parts, the parts are named from the number of parts into which the unit is divided.

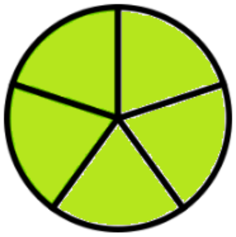


HALVES

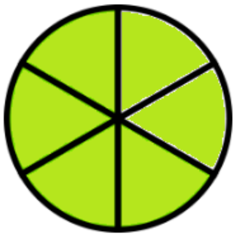
THIRDS



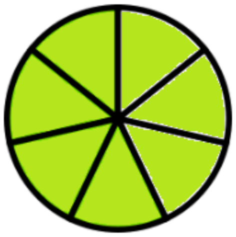
FOURTHS



FIFTHS



SIXTHS



SEVENTHS

2. In 1 cookie there are 2 halves; then, in 3 cookies there are 3 x 2 = 6 halves. Therefore 3 units are reduced to 6 halves.

   EXAMPLE: In 4 apples, how many thirds?
   In 1 apple there are 3 thirds; then in 4 apples there are 4 x 3 = 12 thirds.

   EXAMPLE: Reduce 3 to fifths.
   In 3 there are 3 x 5 = 15 fifths.

☺ EXERCISE

1. **If 4 apples, how many halves?**
2. **In 5 cookies, how many fourths?**
3. **In 7 pizzas, how many sixths?**

4. **Reduce 4 to sevenths.**
5. **Reduce 8 to tenths.**
6. **Reduce 6 to eights.**

Answer: (1) 8 halves (2) 20 fourths (3) 42 sixths (4) 28 sevenths (5) 80 tenths (6) 48 eighths

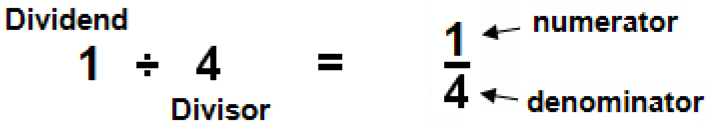
Section 2: The Unit Fraction

3. When a unit is divided into smaller parts, it gives unit fractions of the size half, one-third, one-fourth, one-fifth, one-sixth and so on. We can count using these unit fractions as one-half, one-third, two-thirds, one-fourth, two-fourths, three-fourths, one-fifth, two-fifths, three-fifths, four-fifths, and so on.

4. The more parts we divide a unit into the smaller is the unit fraction. Therefore, one-third is smaller than one-half, one-fourth is smaller than one-third, one-fifth is smaller than one-fourth, and so on. The unit fractions provide us with different sizes to “count” quantities less than one.

5. By dividing one unit into smaller and smaller parts, and then by counting these parts, we can define any quantity between zero and one. Thus, a fraction is a device to express any quantity between zero and one.

6. We express the unit fraction of one-fourth as follows.



The quotient of 1 divided by 4 is one-fourth. But since it is a single number, we call the top and bottom parts as ‘numerator’ and ‘denominator’.

The unit fractions are:

One-half = $1 \div 2$ = $\frac{1}{2}$

One-third = $1 \div 3$ = $\frac{1}{3}$

One-fourth = $1 \div 4$ = $\frac{1}{4}$ **And so on…**

☺ EXERCISE

1. **What is the largest unit fraction?**
2. **What is the smallest unit fraction?**

Answer: (1) One-half (2) As small as you want but not zero.

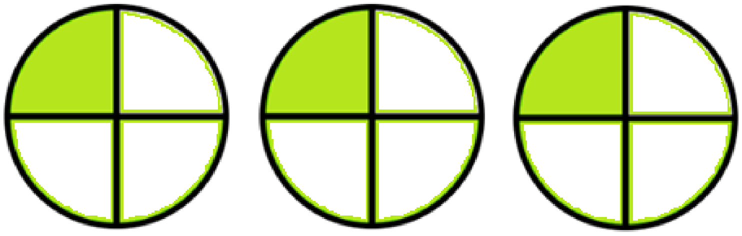
Section 3: The Proper Fraction

7. A proper fraction is a unit fraction or multiples of unit fraction that are less than 1. Therefore, proper fractions made of fifths are: one-fifth, two-fifths, three-fifths and four-fifths. Five-fifths is not a proper fraction because it is equal to 1.

8. You get a proper fraction when you divide a smaller number by a larger number.

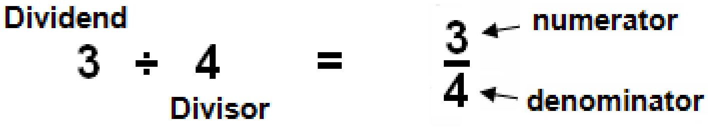
   EXAMPLE: Divide 3 cookies equally among 4 people.

   We first divide a cookie into 4 fourths. Each person gets a fourth from that cookie. Since there are three cookies, each person gets three-fourths.

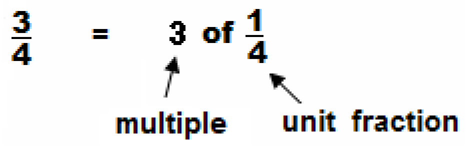


three-*fourths*

Three-*fourths* is written as follows:



Three-fourths is a multiple of the unit fraction one-fourth.



9. In a proper fraction the numerator is less than the denominator.

☺ EXERCISE

1. If an orange is cut into 8 equal parts, what fraction will express 5 of the parts?

Answer: five-eighths, or 5/8

2. Write the following fractions.

(a) Three-*sevenths*
(b) Five-*ninths*
(c) Six-*tenths*
(d) One-*twelfth*
(e) Two-*thirteenths*
(f) Nine-*sixteenths*
(g) Eleven-*twentieths*
(h) Fourteen-*Twenty-ninths*
(i) Thirty-one-*ninety-thirds*

Answer: (a) 3/7 (b) 5/9 (c) 6/10 (d) 1/12 (e) 2/13 (f) 9/16 (g) 11/20 (h) 14/29 (i) 31/93

3. Write the following fractions in words.

(a) $\frac{3}{8}$ (b) $\frac{5}{6}$ (c) $\frac{7}{11}$ (d) $\frac{13}{25}$

Answer: (a) three-eights (b) five-sixths (c) seven-elevenths (d) thirteen-twenty-fifths

Section 4: Improper Fraction & Mixed Numer

10. An improper fraction is a number equal to 1 or more than 1. You get an improper fraction when you divide a number by itself or when you divide a larger number by a smaller number.

EXAMPLE: Divide 4 cookies equally among 4 people.

$$4 \div 4 = \frac{4}{4} \qquad \text{(improper fraction)}$$

EXAMPLE: Divide 25 cookies equally among 8 people.

$$25 \div 8 = \frac{25}{8} \qquad \text{(improper fraction)}$$

The quotient of this division is 3 with a remainder of 1. When we divided the remainder of 1 also by 8, we get an eighth. This makes the quotient “3 and 1/8”. This is called a mixed number.

$$\frac{25}{8} = 3\frac{1}{8} \qquad \text{(mixed number)}$$

To convert an improper fraction into a mixed number, we simply divide the numerator by the denominator. When we divide the remainder also, we get a mixed number.

$$\frac{7}{5} = (7 \div 5 = 1 \text{ remainder } 2 = 1 \text{ and } \frac{2}{5}) = 1\frac{2}{5}$$

11. In an improper fraction the numerator is equal to or greater than the denominator.

☺ EXERCISE

1. Describe the following fractions as proper or improper.

(a) $\frac{23}{30}$ (b) $\frac{30}{30}$ (c) $\frac{37}{30}$ (d) $\frac{37}{40}$ (e) $\frac{998}{999}$ (f) $\frac{3}{2}$

Answer: (a) Proper (b) Improper (c) Improper (d) Proper (e) Proper (f) Improper

2. Write the quotient for the following inexact divisions as mixed numbers.

(a) 8 ÷ 3 (c) 16 ÷ 5 (e) 20 ÷ 3

(b) 9 ÷ 4 (d) 31 ÷ 7 (f) 19 ÷ 6

Answer: (a) 2 & 2/3 (b) 2 & 1/4 (c) 3 & 1/5 (d) 4 & 3/7 (e) 6 & 2/3 (f) 3 & 1/6

3. Reduce the following improper fractions to mixed numbers.

(a) $\frac{4}{3}$ (b) $\frac{15}{8}$ (c) $\frac{11}{5}$ (d) $\frac{13}{3}$ (e) $\frac{39}{10}$ (f) $\frac{108}{12}$

Answer: (a) 1 1/3 (b) 1 7/8 (c) 2 1/5 (d) 4 1/3 (e) 3 9/10 (f) 9

Section 5: Mixed Number to Improper Fraction

12. We may convert a mixed number back to an improper fraction as follows.

EXAMPLE: In 4 1/3 apples, how many thirds?

In 1 apple there are 3 thirds; then in 4 apples there are 4 x 3 = 12 thirds. 12 thirds and 1 third are 13 thirds = **13/3**.

$$4\frac{1}{3} = 4 \text{ and } \frac{1}{3} = \frac{12}{3} \text{ and } \frac{1}{3} = \frac{13}{3}$$

In short, multiply the integer by the denominator of the fraction; to the product add the numerator, and under the sum write the denominator.

$$2\frac{2}{5} = \frac{(2 \times 5) + 2}{5} = \frac{12}{5}$$

☺ EXERCISE

1. Describe the following fractions as proper or improper.

(a) If 3 1/4 apples, how many fourths?

(b) In 5 ½ cookies, how many halves?

(c) In 7 5/6 pizzas, how many sixths?

Answer: (a) 13/4 (b) 11/2 (c) 47/6

2. Express each of the following mixed numbers as improper fractions.

(a) $1\frac{1}{2}$ (b) $1\frac{1}{6}$ (c) $4\frac{3}{5}$ (d) $5\frac{8}{9}$ (e) $5\frac{11}{12}$ (f) $9\frac{5}{7}$

Answer: (a) 3/2 (b) 7/6 (c) 23/5 (d) 53/9 (e) 71/12 (f) 68/7

Section 6: Reducing to Higher Terms

13. A fraction is reduced to higher terms by multiplying both terms by the same number. This does not change its value.

Thus, if both terms of **3/5** are multiplied by 2, the result is **6/10**; in **6/10** there are *twice* as many parts as in **3/5**, but they are only *one-half* as large.

14. To reduce a fraction to higher terms, divide the required denominator by the denominator of the given fraction. Multiply both terms of the fraction by the quotient; the result will be the required fraction.

EXAMPLE: Reduce **2/3** to sixths.

6 ÷ 3 = 2

$$\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$$

EXAMPLE: Reduce **4/5** to thirtieths.

30 ÷ 5 = 6

$$\frac{4}{5} = \frac{4 \times 6}{5 \times 6} = \frac{24}{30}$$

☺ EXERCISE

(a) Reduce ½ to fourths.

(b) Reduce 5/6 to twenty-fourths.

(c) Reduce 3/5 to sixtieths.

(d) Reduce 11/15 to a fraction whose denominator is 135.

(e) Reduce 16/25 to a fraction whose denominator is 100.

(f) Reduce 56/87 to a fraction whose denominator is 1305.

Answer: (a) 13/4 (b) 11/2 (c) 47/6 (d) 99/135 (e) 64/100 (f) 840/1305

Section 7: Reducing to Lowest Terms

15. A fraction is reduced to lower terms by dividing both terms by the same number. This does not change its value.

Thus, if both terms of **6/10** be divided by 2, the result will be **3/5**; in **3/5** there are only *one-half* as many parts as in **6/10**, but they are *twice* as large.

16. A fraction is in its lowest terms when the numerator and denominator have no common factors.

For example, the terms of 9/10 have no common factors, because 9 = 3x3, and 10 = 2x5.

17. To reduce a fraction to lowest terms, divide both terms by a common factor. Divide the resulting fraction in the same manner. So continue to divide until a fraction is obtained whose terms have no common factors.

EXAMPLE: Reduce **24/30** to its lowest terms.

$$\frac{24}{30} = \frac{\cancel{24}^{12}}{\cancel{30}_{15}} = \frac{12}{15}$$ (2 is a common factor of 24 and 30. Divide both terms by 2.)

$$\frac{12}{15} = \frac{\cancel{12}^{4}}{\cancel{15}_{5}} = \frac{4}{5}$$ (3 is a common factor of 12 and 15. Divide both terms by 3.)

The fraction **24/30** is reduced to its lowest terms **4/5**.

18. When the terms of a fraction are large, first find the GCF of both terms per section 6 of **Factoring**. Then divide the terms by their GCF. The resulting fraction will be in its lowest terms.

EXAMPLE: Reduce **8427/10017** to its lowest terms.

The GCF of 8427 and 10017 is 159.

$$\frac{8427}{10017} = \frac{8427 \div 159}{10017 \div 159} = \frac{53}{63}$$

The fraction **8427/10017** is reduced to its lowest terms **53/63**.

☺ EXERCISE

Express each of the following mixed numbers as improper fractions.

(a) $\frac{18}{30}$ (b) $\frac{60}{90}$ (c) $\frac{30}{45}$ (d) $\frac{42}{70}$ (e) $\frac{96}{112}$ (f) $\frac{126}{198}$

Answer: (a) 3/5 (b) 2/3 (c) 2/3 (d) 3/5 (e) 6/7 (f) 7/11

Section 8: Reducing to Least Common Denominator

19. The least common denominator of two or more fractions is the least common multiple (LCM) of their denominators. For example, 6 is the least common multiple of 2 and 3.

20. We find the LCM of the denominators of the fractions per section 7 of **Factoring**. Then we reduce each fraction to another having this denominator.

EXAMPLE: Reduce **3/4, 5/6, 8/9,** and **11/12** to their least common denominator.

The LCM of the denominators 4, 6, 9 and 12 is 36. Each fraction then must be reduced to thirty-sixths.

$$36 \div 4 = 9; \quad \frac{3}{4} = \frac{3 \times 9}{4 \times 9} = \frac{27}{36}$$

$$36 \div 6 = 6; \quad \frac{5}{6} = \frac{5 \times 6}{6 \times 6} = \frac{30}{36}$$

$$36 \div 9 = 4; \quad \frac{8}{9} = \frac{8 \times 4}{9 \times 4} = \frac{32}{36}$$

$$36 \div 12 = 3; \quad \frac{11}{12} = \frac{11 \times 3}{12 \times 3} = \frac{33}{36}$$

21. Convert a mixed number into improper fraction before applying the above procedure,

☺ EXERCISE

Reduce the following to their least common denominator.

(a) $\frac{1}{2}, \ \frac{2}{3}, \ \frac{3}{4}$ (d) $\frac{2}{5}, \ \frac{3}{4}, \ \frac{6}{9}, \ \frac{15}{18}$

(b) $\frac{2}{3}, \ \frac{5}{6}, \ \frac{7}{9}$ (e) $2, \ \frac{3}{4}, \ \frac{5}{9}, \ \frac{7}{12}$

(c) $\frac{3}{4}, \ \frac{5}{8}, \ \frac{11}{16}$ (f) $2\frac{2}{3}, \ \frac{3}{5}, \ 4, \ 5\frac{5}{6}$

Answer: (a) 6/12, 8/12, 9/12 (b) 12/18, 15/18, 14/18 (c) 12/16, 10/16, 11/16 (d) 24/60, 45/60, 40/60, 50/60
(e) 72/36, 27/36, 20/36, 21/36 (f) 80/30, 18/30, 120/30, 175/30

Section 9: Adding Fractions

22. When the fractions have a common denominator, they are parts of the same size. Add the numerators; under the sum write the common denominator.

EXAMPLE: Add **1/5, 2/5,** and **3/5**.

The sum of 1 fifth, 2 fifths and 3 fifths is 6 fifths. 6/5 is equal to 1 1/5.

$$\frac{1}{5} + \frac{2}{5} + \frac{3}{5} = \frac{6}{5} = 1\frac{1}{5}$$

23. When the fractions do not have a common denominator they do not express parts of the same size. Reduce them to least common denominator per Section 8 above. Then add.

EXAMPLE: Add **5/6, 8/9,** and **11/12**.

The LCM of 6, 9, and 12 is 36.

$$\frac{5}{6} + \frac{8}{9} + \frac{11}{12} = \frac{30 + 32 + 33}{36} = \frac{95}{36} = 2\frac{23}{36}$$

24. When adding mixed numbers we may add the integral and fractional parts separately, and their sums then united.

EXAMPLE: Add **2 5/8** and **3 7/12**.

$$2 + 3 = 5$$

$$\frac{5}{8} + \frac{7}{12} = \frac{15 + 14}{24} = \frac{29}{24} = 1\frac{5}{24}$$

$$5 + 1\frac{5}{24} = 6\frac{5}{24}$$

The sum is **6 5/24.**

☺ EXERCISE

Add the following.

(a) $\frac{4}{9} + \frac{5}{9} + \frac{7}{9}$

(b) $\frac{3}{11} + \frac{7}{11} + \frac{8}{11}$

(c) $\frac{2}{3} + \frac{3}{4} + \frac{5}{6}$

(d) $\frac{13}{18} + \frac{8}{15} + \frac{11}{20} + \frac{13}{30}$

(e) $\frac{7}{12} + 2\frac{5}{6} + 3\frac{3}{8} + 3\frac{4}{9}$

(f) $\frac{2}{3} + 2\frac{1}{2} + 4\frac{1}{5} + 6\frac{1}{3}$

Answer: (a) 16/9 or 1 7/9 (b) 18/11 or 1 7/11 (c) 27/12 or 2 1/4 (d) 403/180 or 2 43/180 (e) 10 17/72 (f) 13 21/30

Section 10: Subtracting Fractions

25. When the fractions have a common denominator, they are parts of the same size. From the greater numerator subtract the less; under the remainder write the common denominator.

EXAMPLE: From **5/7** subtract **2/7**.

2 seventh from 5 seventh leaves 3 sevenths.

$$\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$$

EXAMPLE: From **3 1/8** subtract **1 3/8**.

You may convert them to mixed numbers and then subtract.

$$3\frac{1}{8} - 1\frac{3}{8} = \frac{25}{8} - \frac{11}{8} = \frac{14}{8} = \frac{7}{4} = 1\frac{3}{4}$$

26. When the fractions do not have a common denominator they do not express parts of the same size. Reduce them to least common denominator per Section 8 above. Then subtract.

EXAMPLE: From **9/10** subtract **5/6**.

The LCM of 10 and 6 is 30.

$$\frac{9}{10} - \frac{5}{6} = \frac{27 - 25}{30} = \frac{2}{30} = \frac{1}{15}$$

EXAMPLE: From **3 7/12** subtract **2 5/8**.

We may subtract integral and fraction parts of mixed numbers separately as follows.

$$\begin{aligned} 3\tfrac{7}{12} - 2\tfrac{5}{8} &= (3-2) + \left(\frac{7}{12} - \frac{5}{8}\right) \\ &= 1 + \frac{14 - 15}{24} \\ &= 1 + \left(-\frac{1}{24}\right) \\ &= 1 - \frac{1}{24} \\ &= \frac{23}{24} \end{aligned}$$

☺ EXERCISE

Subtract the following.

(a) $\frac{7}{8} - \frac{5}{8}$ (d) $\frac{16}{21} - \frac{5}{14}$

(b) $4\frac{1}{4} - 2\frac{3}{4}$ (e) $3\frac{1}{2} - 1\frac{2}{3}$

(c) $\frac{1}{2} - \frac{1}{3}$ (f) $5 - 2\frac{2}{3}$

Answer: (a) 1/4 (b) 3/2 (c) 1/6 (d) 17/42 (e) 1 5/6 (f) 2 1/3

Section 11: Multiplying Fractions

27. To multiply fractions, multiply together the numerators of the given fractions for the numerator of the product; and multiply together the denominators of the given fractions for the denominator of the product.

EXAMPLE: Multiply **3/4** by **5/8**.

$$\frac{3}{4} \times \frac{5}{8} = \frac{3 \times 5}{4 \times 8} = \frac{15}{32}$$

EXAMPLE: Multiply **3/4** by **2/3**.

$$\frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3} = \frac{6}{12} = \frac{1}{2}$$

28. Before multiplying, it is expedient to cancel out the common factors in numerator and denominator as per section 9 of Factoring.

EXAMPLE: Multiply **3/4** by **2/3**.

$$\frac{3}{4} \times \frac{2}{3} = \frac{{}^{1}\cancel{3} \times \cancel{2}^{1}}{{}_{2}\cancel{4} \times \cancel{3}_{1}} = \frac{1 \times 1}{2 \times 1} = \frac{1}{2}$$

EXAMPLE: Multiply **8/27** by **15/16**.

$$\frac{8}{27} \times \frac{15}{16} = \frac{{}^{1}\cancel{8}}{27} \times \frac{15}{\cancel{16}_{2}} \quad \text{(factor out 8)}$$

$$= \frac{1}{{}_{9}\cancel{27}} \times \frac{\cancel{15}^{5}}{2} \quad \text{(factor out 3)}$$

$$= \frac{1}{9} \times \frac{5}{2} = \frac{5}{18}$$

29. When multiplying fractions by integers, express integers in the form of fractions.

EXAMPLE: Multiply **3/8** by **2**.

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

EXAMPLE: Determine **3/5** of **35**.

Here "of" is translated as multiplication.

$$\frac{3}{5} \text{ of } 35 = \frac{3}{{}_{1}\cancel{5}} \times \frac{\cancel{35}^{7}}{1} = 21$$

30. When multiplying mixed numbers, convert them to improper fractions first.

EXAMPLE: Multiply **2 1/2** by **1 1/2**.

$$2\frac{1}{2} \times 1\frac{1}{2} = \frac{5}{2} \times \frac{3}{2} = \frac{15}{4} = 3\frac{3}{4}$$

EXAMPLE: Determine 1 **3/5** of **1 9/16**.

$$1\frac{3}{5} \times 1\frac{9}{16} = \frac{{}^{1}\cancel{8}}{{}_{1}\cancel{5}} \times \frac{\cancel{25}^{5}}{\cancel{16}_{2}} = \frac{5}{2} = 2\frac{1}{2}$$

☺ EXERCISE

Multiply the following.

(a) $\frac{3}{8} \times \frac{4}{9}$

(b) $\frac{18}{35} \times \frac{7}{9}$

(c) $\frac{5}{3} \times \frac{9}{11} \times \frac{33}{45}$

(d) $7\frac{7}{8} \times 9\frac{1}{7}$

(e) $\frac{5}{8}$ of 24

(f) $1\frac{1}{3} \times 1\frac{1}{5} \times 1\frac{7}{8}$

Answer: (a) 1/6 (b) 2/5 (c) 1 (d) 72 (e) 15 (f) 3

Section 12: Division of Fractions

31. Multiplication and division are inversely related. The multiplicative inverse of a number is 1 divided by that number. The product of a number and its multiplicative inverse is always 1. Division by a number is same as multiplication by its multiplicative inverse.

$$\text{Multiplicative inverse of } 4 = \frac{1}{4}; \qquad 4 \times \frac{1}{4} = 1$$

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

32. The multiplicative inverse of a fraction is obtained by interchanging its numerator and denominator.

$$\text{Multiplicative inverse of } \frac{3}{2} = \frac{2}{3}$$

$$\text{Multiplicative inverse of } \frac{23}{75} = \frac{75}{23}$$

$$\text{Multiplicative inverse of } \frac{1}{2} = 2$$

33. Division by a fraction is the same as multiplication by its multiplicative inverse.

EXAMPLE: Divide **9/16** by **3/8**.

$$\frac{9}{16} \div \frac{3}{8} = \frac{{}^{3}\cancel{9}}{{}_{2}\cancel{16}} \times \frac{\cancel{8}^{1}}{\cancel{3}_{1}} = \frac{3}{2} = 1\frac{1}{2}$$

EXAMPLE: Divide **1/2** by **1/2**.

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

EXAMPLE: Divide **2** by **1/5**.

$$2 \div \frac{1}{5} = \frac{2}{1} \times \frac{5}{1} = 10$$

34. When dividing mixed numbers, convert them to improper fractions first.

EXAMPLE: Divide **6 2/5** by **2 2/15**.

$$\begin{aligned} 6\frac{2}{5} \div 2\frac{2}{15} &= \frac{32}{5} \div \frac{32}{15} \\ &= \frac{\cancel{32}}{\cancel{5}} \times \frac{\cancel{15}^{3}}{\cancel{32}} \\ &= \frac{3}{1} = 3 \end{aligned}$$

35. What part one number is of another is found by division.

EXAMPLE: 1 is what part of 2?

One is ½ of 2; for ½ of 2 is 2/2 or 1.

$$1 \div 2 \quad = \quad \frac{1}{2}$$

EXAMPLE: 2 is what part of 3?

$$2 \div 3 \quad = \quad \frac{2}{3}$$

EXAMPLE: ½ is what part of 3?

$$\frac{1}{2} \div 3 \quad = \quad \frac{1}{2} \times \frac{1}{3} \quad = \quad \frac{1}{6}$$

EXAMPLE: **2/3** is what part of **3/4**?

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

☺ EXERCISE

1. Divide the following.

(a) $\frac{3}{7} \div \frac{4}{7}$

(b) $\frac{8}{15} \div \frac{8}{9}$

(c) $\frac{15}{17} \div \frac{35}{51}$

(d) $5\frac{5}{7} \div \frac{10}{21}$

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

(f) $4 \div \frac{2}{3}$

2. 4 is what part of 12?

3. 2/5 is what part of 3/10?

Answer: 1. (a) 3/4 (b) 3/5 (c) 9/7 (d) 12 (e) 2 1/4 (f) 6 2. 1/3 3. 1 1/3

Section 13: Complex Fractions

36. Complex fractions are reduced to simple fractions by division.

EXAMPLE: Reduce $\dfrac{1\frac{1}{4}}{2\frac{1}{3}}$ to a simple fraction.

$$\frac{1\frac{1}{4}}{2\frac{1}{3}} \quad = \quad 1\frac{1}{4} \div 2\frac{1}{3} \quad = \quad \frac{5}{4} \div \frac{7}{3} \quad = \quad \frac{5}{4} \times \frac{3}{7} \quad = \quad \frac{15}{28}$$

37. When numerators and denominators are complex, we compute them separately first.

EXAMPLE: Reduce $\dfrac{\frac{5}{7} - \frac{4}{21}}{\frac{11}{21} + \frac{3}{14}}$

Numerator $= \frac{5}{7} - \frac{4}{21} = \frac{15 - 4}{21} = \frac{11}{21}$

Denominator $= \frac{11}{21} + \frac{3}{14} = \frac{22 + 9}{42} = \frac{31}{42}$

$$\frac{\textbf{Numerator}}{\textbf{Denominator}} = \frac{\frac{11}{21}}{\frac{31}{42}} = \frac{11}{21} \div \frac{31}{42} = {}_1\frac{11}{\cancel{21}} \times \frac{\cancel{42}^{2}}{31} = \frac{22}{31}$$

☺ EXERCISE

Reduce the following.

(a) $\dfrac{\frac{7}{8} + \frac{11}{12}}{1\frac{1}{16} - \frac{1}{6}}$

(b) $\dfrac{\left(8\frac{2}{5} \div 2\frac{1}{10}\right) - \left(\frac{6}{7} \times 2\frac{11}{12}\right)}{\left(1\frac{1}{4} \times \frac{2}{3}\right) + \left(1\frac{5}{9} \div 2\frac{1}{3}\right)}$

Answer: (a) 2 (b) 1

☺ L2 Lesson Plan 4: Check your Understanding

1. **How does inexact division lead to fractions?**
2. **Why are like fractions easy to add?**
3. **Why is it necessary to simplify a fraction after addition and subtraction?**
4. **How do improper fractions come about?**
5. **What is a mixed number?**
6. **How do you convert unlike fractions to like fractions?**
7. **What is a least common multiple?**
8. **Why does the unit fraction get smaller as the denominator gets bigger?**
9. **Why is it easy to multiply and divide fractions?**
10. **What is a reciprocal?**
11. **What is the key to resolving complex fractions?**

Check your answers against the answers given below.

Answer:

1) When you divide the remainder (a number less than the divisor) by the divisor, you get a measure less than one. We call this measure a fraction.
2) Like fractions are easy to add because they are multiples of the same unit fraction.
3) Simplifying a fraction reduces them to their standard form, which is easier to compare.
4) Improper fractions come about from addition of proper fractions.
5) A number and a proper fraction put together form a mixed number.
6) By generating equivalent fractions whose denominators are the same.
7) It is the smallest common multiple of two or more denominators.
8) Because the more parts you cut something into, the smaller is each part.
9) Because fractions are made of multiplications and divisions.
10) A fraction flipped over becomes its reciprocal.
11) Resolve the fraction one part at a time from inside out.