Fractions Review

Objects used: 12-inch ruler with quarter-inch and eighth-inch marks and metric ruler. If the student has the ruler constructed in Book 4, this may be used.

By this time, your student will have had plenty of hands-on experience working with common fractions, as well as addition, subtraction, and conversion of fractions while using a standard ruler. She will know how to read and write proper, improper, and mixed fractions as well as solve simple equations involving their use. A short review of work taken in previous books in this series is covered here.

(to be given orally)

1. If you have 20 candies and give half of them away, how many have you given away? (10 candies)
2. Is $\frac{1}{2}$ of 20 the same as 20 ÷ 2? (yes)
3. How do you get $\frac{1}{2}$ of any number? (divide by 2)
4. If you shared $\frac{1}{4}$ of 20 candies, how many have you shared? (5 candies)
5. Is $\frac{1}{4}$ of 20 the same as 20 ÷ 4? (yes)
6. How many fourths are in a group of 20 candies? (4)
7. How do you find $\frac{1}{4}$ of any number? (divide it by 4)
8. 5 is what part of 20? ($\frac{1}{4}$)
9. If you divide a wooden board into five equal parts, what is each part called? ($\frac{1}{5}$)
10. What is one-fifth of: 20? 10? 25? 100? 15? 35? 60? (4, 2, 5, 20, 3, 7, 12)

11. If you divide a bowl of popcorn into three equal parts, what is each part called? ($\frac{1}{3}$)

12. What is one-third of 18? 9? 21? 6? 15? 30? 24? (6, 3, 7, 2, 5, 10, 8)

13. 9 is half of what number? (18)

14. What is one-fourth of: 24? 12? 48? 32? 60? 72? 36? (6, 3, 12, 8, 15, 18, 9)

15. 3 is what part of: 12? 6? 15? 9? ($\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{3}$)

16. 7 is one-fifth of what number? (35)

17. How many $\frac{1}{4}$ cups in 1 cup? (4 one-fourth cups) How many $\frac{1}{3}$ cups in 1 cup? (3 one-third cups) How many $\frac{1}{2}$ cups in 1 cup? (2 one-half cups)

18. What is one-eighth of: 16? 40? 32? 56? 24? 48? 80? (2, 5, 4, 7, 3, 6, 10)

19. If you cut 1 length of ribbon into thirds, how many pieces of ribbon would there be? (3 pieces)

20. How many quarters in a dollar? (4 quarters)

21. How many quarters in four dollars? (16 quarters)

22. Charlotte placed $\frac{1}{4}$ of 28 books on the shelf. How many books are on the shelf? (7 books)

23. What is $\frac{1}{4}$ of: 80? 44? 16? 36? 12? 28? 8? (20, 11, 4, 9, 3, 7, 2)

24. 5 is $\frac{1}{3}$ of what number? (15)

25. If you need to measure 1 cup of sugar but have only a $\frac{1}{3}$ measuring cup, what must you do? (Count out 3 measures, or fill the $\frac{1}{3}$ cup 3 times.)

Dictate the following while your student notates on either slate or paper:

1. One-third ($\frac{1}{3}$)
2. Three-fourths ($\frac{3}{4}$)
3. Nine and one-fifth ($9\ \frac{1}{5}$)
4. One-half ($\frac{1}{2}$)
5. Two-thirds ($\frac{2}{3}$)

Write the following fractions on a slate and have your student read them aloud:

1. $\frac{4}{5}$ (four-fifths)
2. $\frac{3}{8}$ (three-eighths)
3. $\frac{1}{4}$ (one-fourth or one-quarter)
4. $\frac{2}{4}$ (two-fourths or two-quarters)
5. $\frac{7}{8}$ (seven-eighths)

Using a standard ruler, have your student answer the following, being sure to give the unit of measure in her answer.

1. How many half-inches in 5"? (10 half-inches)
2. How many half-inches in half a foot? (12 half-inches)
3. Is $\frac{12}{2}$ the same as 6? (yes)
4. $3\ \frac{1}{2}" + 2" = ?$ ($5\ \frac{1}{2}"$)
5. $7\ \frac{1}{2}" + 4\ \frac{1}{2}" =$ (12" or 1')
6. How many quarter-inches in 1"? (4 quarter-inches)
7. How many quarter-inches in 2"? (8 quarter-inches)

8. Is $\frac{8}{4}$ the same as 2? (yes)
9. How many quarter-inches in $6\ \frac{1}{4}$"? (25 quarter-inches)
10. $3\ \frac{3}{4}$" + $5\ \frac{1}{4}$" = ? (9")
11. How many eighth-inches in 1 inch? (8 eighth-inches)
12. How many eighth-inches in 10 inches? (80 eighth-inches)
13. Is $\frac{80}{8}$ the same as 10? (yes)
14. 40 eighth-inches equals how many inches? (5 inches)
15. $1\ \frac{1}{8}$" + $\frac{6}{8}$" = ($1\ \frac{7}{8}$")

Convert quarter-inches and eighth-inches to inches.

1. 6 half-inches equals how many inches? (3 inches)
2. 20 quarter-inches equals how many inches? (5 inches)
3. If I ask you to divide 20 by 4, do you get the same answer as the previous question? (yes)
4. 24 eighth-inches equals how many inches? (3 inches)
5. If I ask you to divide 24 by 8, do you get the same answer as the previous question? (yes)

Allowing your student to look at the metric ruler, ask the following:

1. What part of a centimeter is 1 millimeter? (one-tenth)
2. How many millimeters in $1\ \frac{1}{2}$ centimeters? (15 mm)
3. How many millimeters in $\frac{3}{10}$ of a centimeter? (3 mm)
4. $2\ \frac{7}{10}$ cm equals how many millimeters? (27 mm)
5. $\frac{3}{10}$ cm + $\frac{7}{10}$ cm = how many centimeters? (1 cm)

Fractions and Ideas of Fractions

(instructions to the parent)

This section introduces and works with the terminology of fractions while underscoring two ideas: fractions as a division of a quantity and fractions as parts of a whole. These ideas will lead the student to the idea of decimals representing fractional parts. She has already had hands-on experience as well as written work with fractions, our decimalized monetary system, and decimals and their numeration and notation. More work with fractions will be dealt with in greater depth later in the book.

1. Explain: You have met a few ideas of fractions in your previous studies. One idea is that a fraction expresses division of a quantity. For example, 2 chocolate bars are to be shared equally among 3 friends. No one will receive a whole bar, so we must divide the 2 bars into 3 equal pieces.

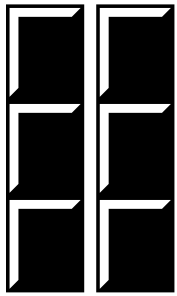
   Write on the slate: $2 \div 3$

2. Say: This is also expressed as a fraction.

   Write on the slate using a horizontal fraction bar: $\frac{2}{3}$

   Point out that 2 represents the chocolate bars, the fraction bar represents division, and the 3 represents the friends.

2	chocolate bars		dividend
—		÷	
3	friends		divisor



   Here's another example: If 8 friends share 1 pizza equally, we have

1 pizza divided into 8 equal slices, which can be expressed as the fraction 1 over 8:

Write on slate using a horizontal fraction bar: $\frac{1}{8}$

3. Say: This fraction shows 1 pizza is divided by 8, that is, 1 ÷ 8. In this way, fractions can be used to represent any division problem. The fraction line is seen as another symbol for division, with the number on top as the dividend and the bottom number as the divisor.

1	pizza	dividend
—		÷
8	friends	divisor

Explain: You have also seen the idea of fractions as parts of a whole. For example, if a person eats 1 slice of the 8 slices of pizza, the one slice is shown in relationship to the part, or portion, of the whole pizza that those 8 slices represent. This is expressed as $\frac{1}{8}$.

If someone ate 3 slices of the pizza, it is expressed as $\frac{3}{8}$.

Write on the slate: $\frac{3}{8}$

In this way, fractions can record any quantity as a part, or portion, of a whole.

4. Write on the slate: $\frac{1}{4}$

Explain: If you were baking cookies and measured $\frac{1}{4}$ cup of chocolate chips, this measurement shows a quantity that relates to a whole cup.

Ask: If you filled the $\frac{1}{4}$ cup 2 more times, what quantity of chocolate chips have you? ($\frac{3}{4}$ cup)

5. Write on the slate: $\frac{3}{4}$ *c.*

Ask: How many $\frac{1}{4}$ cup measures are in a cup? (4 measures)

6. Say: So, you see how a fraction represents a fractional part—that is—an equal part of a whole. In this case, it is one whole cup.

   Continue: $\frac{1}{2}$ of a foot clearly shows us how the part relates to a whole foot. $\frac{3}{16}$ of a pan of brownies could be eaten if the pan were divided into 16 portions.

   We could print 45 pages of a document, but the document could be 50, 75, 101, 299, or 407 pages long. The fractions $\frac{45}{75}$, $\frac{45}{101}$, or $\frac{45}{407}$ give us a much clearer picture of what part of the whole document has been printed.

   Likewise, an acre of land could be divided into 6 plots, 7 plots, 9 plots, or 12 plots.

   $\frac{5}{6}$ of the plots could have been sold, $\frac{2}{7}$ of the plots might be sold, or $\frac{4}{9}$, or $\frac{1}{12}$, giving us a clear understanding of the parts of the whole.

7. Ask the student to name any 10 fractions.

8. Now, introduce some fraction terminology, saying: The bottom number in a fraction is called the *denominator* and tells the number of parts into which the whole is divided, or how many parts are in the whole. The top number is called the *numerator* and numbers how many parts of the whole we are considering.

9. Write on the slate: $\frac{3}{8}$

   Write *numerator* next to the 3 and *denominator* next to the 8.

   Say: The terms *numerator* and *denominator* are used to describe the parts of a fraction.

10. Ask your student to write $\frac{5}{7}$ in her notebook and write the terms next to each number.

$$\begin{array}{r} 0.0 \\ 2\overline{)0.16} \end{array}$$

There are no tenths in the answer so we must write a zero in the tenths place of the quotient before moving to the hundredths place

$$\begin{array}{r} 0.08 \\ 2\overline{)0.16} \\ -\ 0.16 \\ \hline 0 \end{array}$$

16 hundredths

Answer: 0.08 m

Explain: Since the answer should be given as hundredths of a meter, we must be careful not to write or say 0.8 m, but 0.08 m. Remember that there must be a digit in each decimal place of the quotient, so we must be careful to put a zero as a placeholder for each of the places after the decimal point into which the divisor will not go.

3. Ask: When dividing 0.024 by 8, can you tell what place value name your answer will have? (thousandths)

   How many zeros will there be to the right of the decimal point before the first non-zero digit? (2 zeros)

Tip: If your student is unable to answer the previous two questions after some thought, simply move on to the written work of the problem as her solution will provide the answers.

$$\begin{array}{r} . \\ 8\overline{)0.024} \end{array}$$

Place a decimal point in the quotient over the decimal point in the dividend, then divide.

$$\begin{array}{r} 0.00 \\ 8\overline{)0.024} \end{array}$$

There are no units, tenths, or hundredths in the quotient so write zeros in those places before moving to the thousandths place.

$$\begin{array}{r} 0.003 \\ 8\overline{)0.024} \\ -\ 0.024 \\ \hline 0 \end{array}$$

24 thousandths

Answer: 0.003

Exercises

(to be completed in the math notebook)

The following may be assigned as independent written work if the student is working with accuracy and understanding. She should be sure to label any units of measure.

1. 4.2 cm ÷ 6
2. 57.96 ft. ÷ 9
3. 7.35 ÷ 7
4. 106.59 ÷ 51
5. Jennifer bottled 20.24 gallons of lavender oil. She evenly filled 44 bottles. What part of a gallon were in each bottle?
6. Daniel rode his bicycle 76.2 kilometers in 3 hours. How many kilometers did he average an hour?
7. Divide 0.125 by 5.
8. Divide the answer to #1 by 5.
9. Divide 2.466 by 6.
10. Divide the answer to #3 by 3.

Answers are on page 306.

Adding Zeros Without Changing the Value

(instructions to the parent)

1. Say and show: You'll recall that when we write 2 dollars, we often write it as $2.00 to show there are no fractional parts of the dollar, that is, we have 2 dollars and no tenths or hundredths of a dollar. Having only zeros after the decimal point does not change its value in any way, just as having zeros after the final non-zero number after the decimal point does not change any number's value.

2. Ask your student to write the following dollar amounts on her slate, showing there are no fractional parts:

   seven dollars (*$7.00*)

   three dollars (*$3.00*)

   nine dollars (*$9.00*)

   four dollars (*$4.00*)

   eleven dollars (*$11.00*)

3. Say: In the same way, if we have a whole number such as 4, and we want to divide it by a larger number, such as 5, we could write 4.0 or 4.00 without changing its value.

Tip: If this process is unclear, imaginary money may be thought of to understand how this works. The dollar bills will have to be changed to 40 dimes, with each person receiving 8 dimes, or $0.80. Remind your student that placing a 0 after a decimal or after the final non-zero digit does not change its value. If the process is still unclear, get out real or play money.

```
  0.          0.          0.8
5)4.0       5)4.0       5)4.0
- 0         - 0.↓       - 0.↓
              4           4.0
                        - 4.0
                            0
```

4. Have your student work 2 ÷ 5 on the slate.

```
  0.          0.          0.4
5)2.0       5)2.0       5)2.0
- 0         - 0.↓       - 0.↓
              2           2.0
                        - 2.0
                            0
```

5. Read each problem aloud, having your student restate the dividend as a whole number and a decimal—with a zero in the tenths place—and solve mentally:

Tip: If the student is unable to solve these mentally, she may use written work in her notebook.

2 ÷ 4? (2.0 ÷ 4 = 0.5)

3 ÷ 6? (3.0 ÷ 6 = 0.5)

4 ÷ 8? (4.0 ÷ 8 = 0.5)

5 ÷10? (5.0 ÷ 10 = 0.5)

1 ÷ 2? (1.0 ÷ 2 = 0.5)

1 ÷ 5? (1.0 ÷ 5 = 0.2)

8 ÷ 10? (8.0 ÷ 10 = 0.8)

3 ÷ 5? (3.0 ÷ 5 = 0.6)

6. Have your student write the following on the place value chart in a column and read the decimals aloud:

0.1 (1 tenth)

0.10 (10 hundredths)

Round down to the nearest half-hour. (3:00)

Let's take another time of 9:56 and round each way (to be written on the slate as above):

Round to the nearest quarter-hour. (10:00)

Rounded up to the nearest quarter-hour. (10:00)

Round down to the nearest quarter-hour. (9:45)

Round to the nearest half-hour. (10:00)

Round up to the nearest half-hour. (10:00)

Round down to the nearest half-hour. (9:30)

Exercises

(to be given orally)

1. Round to the nearest half-hour:

   6:11 (6:00) 7:35 (7:30) 12:05 (12:00) 8:48 (9:00)

2. Round up to the nearest half-hour:

   6:11 (6:30) 7:35 (8:00) 12:05 (12:30) 8:48 (9:00)

3. Round down to the nearest half-hour:

   6:11 (6:00) 7:35 (7:30) 12:05 (12:00) 8:48 (8:30)

4. Round to the nearest quarter-hour:

   6:11 (6:15) 7:35 (7:30) 12:05 (12:00) 8:48 (8:45)

5. Round up to the nearest quarter-hour:

6:11 (6:15) 7:35 (7:45) 12:05 (12:15) 8:48 (9:00)

6. Round down to the nearest quarter-hour:

6:11 (6:00) 7:35 (7:30) 12:05 (12:00) 8:48 (8:45)

Exercises

(to be worked in the math notebook)

The following may be assigned as independent work, with your student working as many as she is able in a given amount of time. In the next lesson, pick up wherever she left off.

Round each of the following first to the nearest hour, then round to the nearest half-hour, and then to the nearest quarter-hour:

1. 5:12 11:24 2:53 9:39
2. 4:08 10:44 1:17 12:32
3. 7:28 5:10 8:45 6:31

Answers are on page 310.

Mixed Review

(to be worked in the math notebook)

1. Write the following numbers in Roman numerals:

   12 20 57 110 1,116

2. 672×53
3. $48\overline{)9840}$

4. How many cubic meters is a block of marble that is 2 meters long, 2 meters wide, and 4 meters high?

5. Jolene made a pan of brownies that is 2 inches thick, 9 inches wide, and 12 inches long. How many cubic inches is that?

Answers are on page 310.

Measurement by Decimals

(instructions to the parent)

Objects used: ruler with metric measures and homemade ruler in tenths of inches, 3" × 5" index card, fabric measuring tape or string, geometry compass or object with which to trace a circle

Note: Over the next few lessons, students will be exploring geometry principles such as area, circumference, diameter, pi, etc. The focus of these exercises will be on the arithmetic required to work with these ideas. Further exploration of the geometrical reasoning behind these concepts appears beginning in Charlotte Mason Practical Geometry, Part I *and are expanded upon in later books in the geometry series.*

Following is hands-on work in measurement with decimals that also exercises the student's reasoning powers through ideas that will later be found in geometry. The formation of good habits in both the processes of arithmetic and accuracy in taking measurements, drawing, and notation should be ensured. The student should always work with measurements she takes herself—though they may vary slightly with those given here. All work and answers should be notated in the math notebook.

1. Say: Measure the length and width of the front page of this book in centimeters, rounding to the nearest tenth. If you are using an electronic version of this book, choose any book page to measure.

Tip: Give your student plenty of time to see if she can arrive at the process on her own and tell you the steps she is taking.

$2\frac{1}{4} = 1\frac{4}{4} + \frac{1}{4} = 1\frac{5}{4}$ — After changing a whole to fractional form, we must add the fractions in the minuend together before we are able to take from them.

$2 - 1 = 1$ — Subtract whole numbers.

$\frac{5}{4} - \frac{3}{4} = \frac{2}{4}$ — Subtract fractions, simplifying as necessary.

$1\frac{1}{2}$ hours

Have your student solve the following on her slate, letting you know how she worked each problem. The steps are provided for the first.

$8\frac{1}{3} - 3\frac{2}{3} =$

$8\frac{1}{3} = 7\frac{3}{3} + \frac{1}{3} = 7\frac{4}{3}$ — After changing a whole number to fractional form, add the fractions together before subtracting from them.

$7 - 3 = 4$ — Subtract whole numbers.

$\frac{4}{3} - \frac{2}{3} = \frac{2}{3}$ — Subtract fractions, reducing as necessary.

$4\frac{2}{3}$

$9\frac{1}{6} - 2\frac{5}{6} =$ $(6\frac{2}{6} = 6\frac{1}{3})$

$5\frac{3}{8} - 4\frac{7}{8} =$ $(\frac{4}{8} = \frac{1}{2})$

3. Have your student solve the following in her math notebook, either circling or placing a box around her final answer. Be sure she keeps her work as neat and ordered as possible.

   Explain: Just as with addition of mixed numbers, subtraction problems may be solved by converting the mixed numbers to improper fractions then converting the answer back to a mixed number.

   Solve the following by converting to improper fractions, subtracting, and converting the answer back to a mixed number. After you've found the solution, check each answer immediately by working the problem again using the first method. Then you can decide which method is most convenient.

Tip: The first subtraction sum has the steps shown for your convenience.

$3\frac{2}{8} - 1\frac{7}{8} =$

$3\frac{2}{8} - 1\frac{7}{8} = \frac{26}{8} - \frac{15}{8}$	Convert both mixed numbers to improper fractions.
$\frac{26}{8} - \frac{15}{8} = \frac{11}{8}$	Subtract the improper fractions.
$\frac{11}{8} = 1\frac{3}{8}$	Change the improper fraction back to a mixed number, reducing as necessary.

Check the answer using the first method:

$3\frac{2}{8} = 2\frac{8}{8} + \frac{2}{8} = 2\frac{10}{8}$	After changing one whole number to fractional form, add the fractions together before subtracting from them.
$2 - 1 = 1$	Subtract whole numbers.

$\frac{10}{8} - \frac{7}{8} = \frac{3}{8}$ Subtract fractions, reducing as necessary.

$1\frac{3}{8}$

Exercises

(to be worked in math notebook)

If your student is able to work the first three exercises with understanding, she may be assigned the remaining problems as independent work.

1. $5\frac{5}{12} - 4\frac{7}{12} =$
2. $6\frac{3}{5} - 2\frac{4}{5} =$
3. $8\frac{1}{6} - 3\frac{5}{6} =$
4. $9\frac{2}{7} - 5\frac{5}{7} =$
5. $5\frac{9}{13} - 4\frac{7}{13} =$
6. $27\frac{5}{13} - 9\frac{7}{13} =$
7. $2\frac{1}{3} - 1\frac{2}{3} =$
8. $7\frac{2}{21} - 4\frac{7}{21} =$
9. $17\frac{3}{9} - 6\frac{7}{9} =$
10. $12\frac{3}{13} - 9\frac{5}{13} =$

Answers

1. $5\frac{5}{12} - 4\frac{7}{12} = 4\frac{17}{12} - 4\frac{7}{12} = \frac{10}{12} = \frac{5}{6}$ OR $5\frac{5}{12} - 4\frac{7}{12} = \frac{65}{12} - \frac{55}{12} = \frac{10}{12} = \frac{5}{6}$
2. $6\frac{3}{5} - 2\frac{4}{5} = 5\frac{8}{5} - 2\frac{4}{5} = 3\frac{4}{5}$ OR $6\frac{3}{5} - 2\frac{4}{5} = \frac{33}{5} - \frac{14}{5} = \frac{19}{5} = 3\frac{4}{5}$
3. $8\frac{1}{6} - 3\frac{5}{6} = 7\frac{7}{6} - 3\frac{5}{6} = 4\frac{2}{6} = 4\frac{1}{3}$ OR $8\frac{1}{6} - 3\frac{5}{6} = \frac{49}{6} - \frac{23}{6} = \frac{26}{6} = 4\frac{2}{6} = 4\frac{1}{3}$

Answers 4–10 are on page 336.

Subtraction of Fractions Review – Mixed Numbers

(to be worked in the math notebook)

The following may be assigned as independent work with the student solving by her preferred method. She should work as many as she is able in a given amount of time, then pick up where she left off in the next lesson.

1. $1\frac{1}{10} - \frac{3}{10} =$
2. $2\frac{1}{4} - 1\frac{3}{4}$
3. $9\frac{3}{16} - 7\frac{9}{16} =$
4. $97\frac{4}{19} - 18\frac{12}{19} =$
5. $7\frac{2}{17} - 4\frac{6}{17} =$
6. $27\frac{4}{25} - 13\frac{12}{25} =$
7. $33\frac{1}{12} - 26\frac{5}{12} =$
8. $5\frac{2}{33} - 2\frac{5}{33} =$
9. $77\frac{1}{7} - 66\frac{3}{7} =$
10. $4\frac{1}{9} - 1\frac{4}{9} =$

Answers are on page 337.

Exercises

(to be given orally)

Simplify the following fractions by reducing to lowest terms:

$\frac{6}{12}$ $(\frac{1}{2})$ $\frac{10}{15}$ $(\frac{2}{3})$ $\frac{6}{8}$ $(\frac{3}{4})$ $\frac{5}{25}$ $(\frac{1}{5})$ $\frac{14}{16}$ $(\frac{7}{8})$ $\frac{3}{12}$ $(\frac{1}{4})$ $\frac{3}{9}$ $(\frac{1}{3})$

$\frac{8}{12}$ $(\frac{2}{3})$ $\frac{7}{14}$ $(\frac{1}{2})$ $\frac{8}{24}$ $(\frac{1}{3})$

Change the following fractions:

$\frac{3}{4}$ to twelfths $(\frac{9}{12})$

$\frac{5}{8}$ to sixteenths $(\frac{10}{16})$

$\frac{1}{3}$ to sixths $(\frac{2}{6})$

$\frac{2}{5}$ to tenths $(\frac{4}{10})$

$\frac{2}{3}$ to twelfths $(\frac{8}{12})$

$\frac{5}{6}$ to eighteenths $(\frac{15}{18})$

$\frac{3}{4}$ to eighths ($\frac{6}{8}$)

$\frac{1}{2}$ to tenths ($\frac{5}{10}$)

$\frac{3}{5}$ to fifteenths ($\frac{9}{15}$)

$\frac{2}{3}$ to twenty-fourths ($\frac{16}{24}$)

Ask: When multiplying the terms of a fraction by the same number, does its value change? (no)

Mixed Review

(to be given orally)

1. There are 12 weeks in a term of school. How many weeks in 3 terms? (36 weeks)
2. How many inches in 20 feet? (240")
3. If there are 33 lines on a page and 11 words per line, how many words on a page? (363 words)
4. How many days in 72 hours? (3 days)
5. If 12 notebooks cost 84 dollars, how much do 2 notebooks cost? ($14)
6. Abram had $1.00, and spent 25 cents for a gum ball and 45 cents for a sticker. How much money had he left? (30 cents)
7. It cost Jared $38 in materials to build a bookshelf that he sold for $75. How much did Jared earn? ($37)
8. The sum of three numbers is 50. If one number is 14 and another number is 22, what is the third number? (14)
9. The age of three cousins is 14, 16, and 18 years. What is their average age? (16 years)
10. Which is worth more, $3 or 10 quarters? ($3)

11. How many minutes are in $\frac{2}{3}$ of an hour? (40 minutes)
12. How many minutes in $\frac{3}{4}$ of an hour? (45 minutes)
13. How many minutes in $\frac{4}{5}$ of an hour? (48 minutes)
14. How many minutes in $\frac{5}{6}$ of an hour? (50 minutes)
15. Lake Wautaga is 260 ft. deep. Pike Lake is $\frac{1}{4}$ as deep as Lake Wautaga. How deep is Pike Lake? (65 ft.)

Addition and Subtraction of Mixed Numbers with Different Denominators Review

(to be worked in the math notebook)

These may be assigned as independent work if your student displays understanding with the first two problems. She should work for an assigned amount of time and carry on where she left off in the next lesson.

Tip: It may or may not be necessary to write out every step in the solution to a problem. Just be sure the written work is expansive enough that the student can use it to explain her line of thinking in obtaining the answer.

Solve the following using either method of adding and subtracting mixed numbers. Choose five to check immediately by solving again with the alternate method.

1. If Jo is $15\frac{3}{4}$ years old, and Amy is $12\frac{5}{6}$ years old, what is the difference between their ages?
2. Meg is $16\frac{1}{6}$ years old and Beth is $13\frac{7}{8}$ years old. What is their difference in age?
3. Laurie is carrying a parcel that weighs $5\frac{7}{16}$ lb. and a parcel that weighs $3\frac{1}{2}$ lb. How much is he carrying in all?

4. During free time, Emily spends $3\frac{2}{5}$ hours in the garden and $2\frac{2}{3}$ hours writing poetry. How much free time did Emily have in all?

5. Find the sum of $5\frac{8}{9}$ and $3\frac{1}{4}$.

6. $7\frac{1}{8} + 4\frac{3}{10}$

7. What is the difference between $8\frac{3}{4}$ and $6\frac{4}{11}$?

8. $9\frac{3}{8} - 3\frac{2}{5}$ 9. $8\frac{2}{3} - 5\frac{3}{4}$ 10. $6\frac{2}{9} + 7\frac{5}{6}$

Answers

1. $15\frac{3}{4} - 12\frac{5}{6} = 15\frac{9}{12} - 12\frac{10}{12} = 14\frac{21}{12} - 12\frac{10}{12} = 2\frac{11}{12}$ years, or 2 years, 11 months
2. $16\frac{1}{6} - 13\frac{7}{8} = 16\frac{4}{24} - 13\frac{21}{24} = 15\frac{28}{24} - 13\frac{21}{24} = 2\frac{7}{24}$ yr.

Answers 3–10 are on page 337.

Mixed Review

The following may be taken as independent written work. The student should ensure all units of measure are written with the answers.

What is the cost of:

1. 486 books at $15 each?
2. 204 bookmarks at $3 apiece?
3. 99 bookshelves at $75 each?
4. 34 book lights at $9 each?
5. 160 book covers at $20 apiece?

Change

6. 351 feet to yards.
7. 3,000 seconds to minutes.

8. 546 days to weeks.

9. 4,320 hours to days.

10. 448 ounces to pounds.

Answers are on page 338.

Canceling

(instructions to the parent)

Your student has previously divided both terms of a fraction with the GCF in order to reduce a fraction to lowest terms. She has also learned that simplifying fractions to lower terms does not change the value of the fraction. Now she will be shown a new way to reduce fractions called canceling. Be sure to have her give answers herself whenever possible.

1. Explain with use of a slate. You learned that when reducing fractions to lower terms by dividing both terms by the same number, the value of the fraction remains the same. For example, dividing both terms of $\frac{6}{8}$ by 2 gives $\frac{3}{4}$ and is written thus:

$$\begin{array}{ccccc} 6 & \div & 2 & = & 3 \\ \hline 8 & \div & 2 & = & 4 \end{array}$$

Say. We can also reduce $\frac{6}{8}$ to $\frac{3}{4}$ using a method called canceling.

Step 1: Think by which number both terms are evenly divisible.

(Both 6 and 8 are evenly divisible by 2.)

Step 2: Mentally divide the numerator by this number. Then cancel by crossing out the numerator and writing the reduced numerator above it.

Think 6 ÷ 2 = (3)

$\frac{6}{8}^{3}$

Step 3: Mentally divide the denominator by the same number. Cancel by crossing out the denominator and writing the reduced denominator below it.

Think 8 ÷ 2 = (4)

$\frac{6}{8}^{3}_{4}$

Step 4: Write the answer.

$\frac{6}{8}^{3}_{4} = \frac{3}{4}$

2. Have your student reduce the following fractions to lowest terms, using the method of cancellation:

$\frac{6}{18}$ $(\frac{1}{3})$ $\frac{15}{20}$ $(\frac{3}{4})$ $\frac{4}{10}$ $(\frac{2}{5})$ $\frac{8}{12}$ $(\frac{2}{3})$ $\frac{9}{27}$ $(\frac{1}{3})$

Exercises

(to be worked in the math notebook)

Your student may take the following as independent work if she has worked the above with understanding.

Reduce the following fractions to lowest terms by canceling:

1. $\frac{8}{10}$ 2. $\frac{14}{35}$ 3. $\frac{3}{15}$ 4. $\frac{9}{24}$ 5. $\frac{15}{27}$

6. $\frac{5}{10}$ 7. $\frac{6}{15}$ 8. $\frac{10}{25}$ 9. $\frac{9}{12}$ 10. $\frac{8}{18}$

Answers are on page 338.

Canceling Large Fractions

(instructions to the parent)

1. State: When reducing a large fraction to lowest terms, you previously found the GCF. You may also use canceling more than once as another method to simplify a large fraction.

   For example, let's use the steps in canceling to reduce $\frac{48}{72}$.

   Step 1: Think by which number both terms are obviously evenly divisible. (Both 48 and 72 are evenly divisible by 6.)

   Step 2: Mentally divide the numerator by this number. Then cancel by crossing out the numerator and writing the reduced numerator above it.

   Think 48 ÷ 6 = (8)

   $\frac{\cancel{48}\,8}{72}$

   Step 3: Mentally divide the denominator by the same number. Cancel by crossing out the denominator and writing the reduced denominator below it.

   Think 72 ÷ 6 = (12)

   $\frac{\cancel{48}\,8}{\cancel{72}\,12}$

   This lowers the terms of the fraction, but it still isn't in lowest terms.

   Step 4: Reduce to lowest terms by canceling again. Continue canceling until the fraction is in lowest terms.

   $\frac{\cancel{8}\,2}{\cancel{12}\,3}$ Think 8 ÷ 4. Cancel 8 and write 2.

   Think 12 ÷ 4. Cancel 12 and write 3.

Step 5: Write the answer.

$\frac{48}{72} = \frac{2}{3}$

2. Reduce the following fractions to lowest terms by canceling as many times as necessary.

   Have your student reduce the following fractions to lowest terms, using the method of cancellation:

   $\frac{45}{60}$ $(\frac{3}{4})$ $\frac{30}{45}$ $(\frac{2}{3})$ $\frac{18}{54}$ $(\frac{1}{3})$ $\frac{49}{70}$ $(\frac{7}{10})$ $\frac{18}{108}$ $(\frac{1}{6})$

Exercises

(to be worked in math notebook)

Your student may take the following as independent work if she has worked the above with understanding. Have her work as many as able in a given amount of time, picking up where she left off in the next lesson.

Simplify the following fractions by canceling as many times as necessary to reduce them to lowest terms:

1. $\frac{32}{80}$ 2. $\frac{12}{48}$ 3. $\frac{48}{102}$ 4. $\frac{45}{105}$ 5. $\frac{56}{360}$

6. $\frac{108}{135}$ 7. $\frac{64}{100}$ 8. $\frac{48}{120}$ 9. $\frac{30}{54}$ 10. $\frac{168}{320}$

Answers are on page 338.

Baking Using Fractions

Congratulations on completing Book 5! This special recipe is to celebrate your job well done. It first appeared in the children's section of *The Parent's Review*—a monthly magazine edited by Charlotte Mason and Emeline

Steinthal. Though the recipe has Christmas in the name, these tiny cakes are perfect anytime. They are so delicious, you will probably want to use your math skills to immediately double the recipe!

Christmas Chocolate Buns

Note: The original recipe by Helena Steinthal has been adapted for a contemporary audience. Caster sugar (sometimes spelled castor) is also called super fine sugar. It is ground a bit finer than our granulated sugar but not nearly as fine as powdered sugar. If caster sugar/super fine sugar is not carried at your local grocery, it may be made by pulsing the sugar in a food processor or blender for 2 to 3 pulses.

Ingredients

$\frac{3}{4}$ c. caster sugar

$\frac{1}{2}$ c. unsalted butter at room temperature

$\frac{1}{2}$ c. flour

$\frac{1}{2}$ c. chocolate chips, melted

3 eggs, separated

Powdered sugar for dusting

Preheat oven to 350°.

Butter a 12-cup muffin pan and set aside.

Directions

1. Cream together the butter and sugar, add the melted chocolate chips (cooled slightly so the eggs don't scramble) and egg yolks, and stir until blended, then fold in the flour.
2. In a separate bowl, beat the egg whites to a froth—this can take longer than expected, even with a mixer. Little bubbles should appear throughout and the color will change slightly, but soft peaks will not yet form. When frothed, add to the mixture and fold in carefully to combine.
3. Divide batter evenly between the cups, filling them just under half full.
4. Bake about 15–20 minutes until a toothpick inserted into the center comes out clean.
5. Remove from pan and allow to cool completely on wire rack.
6. Dust with powdered sugar and enjoy!

Mental Math — Rapid Oral Work

The goal of this 5-minute time of rapid oral work is to increase accuracy and speed while building habits such as attention and promptness. The questions are written in such a way as to be easily expanded by fitting in different numbers. The student(s) should be invited to come up with their own mental math problems to pose to you or to one another as well.

Another great way to provide more mental math is by using the Number Sentence Cards. These sets of clearly printed Number Sentence Cards offer more than 1,000 ready-to-use equations that help the student build or retain speed and accuracy with the math facts. The cards are sold separately