Fraction Competency Packet

To use this booklet, review the glossary, study the examples, then work through the exercises. The answers are at the end of the booklet. When you find an unfamiliar word, check the glossary for a definition or explanation.

Calculators are not allowed when taking the Computerized Placement Test (CPT), nor in Fundamentals of Mathematics, Pre-Algebra, and Elementary Algebra; therefore, do not rely on a calculator when working the problems in this booklet.

If you have difficulty understanding any of the concepts, come to one of the Tutoring Centers located on the Lynn, Danvers Main and Danvers Hathorne Campuses. Hours are available at (978) 762-4000 x 5410. Additional Tutoring Center information can be found on the NSCC website at www.northshore.edu/services/tutoring. The Centers are closed when school is not in session, and Summer hours are limited.

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Glossary

Boosting: Rewriting a fraction as an equivalent fraction with a higher denominator.

Denominator: Bottom number of a fraction indicating how many parts make a whole.

Difference: The result when two numbers are subtracted.

Divisor: The number after the division sign in a division problem, (i.e. 12÷**7**); or the bottom number of a fraction, (i.e. $\frac{12}{7}$); the number "outside" the division house (i.e. $\mathbf{7}\overline{)12}$).

Equivalent Fraction: Fractions that are found by multiplying the numerators and denominators by the same number.

Factor: Numbers equal to or less than a given number that divides the number evenly. For example, the factors of 12 are 1, 2, 3, 4, 6, 12.

Fraction: Any number written in the form of one whole number over another, $\left(\frac{3}{5}\right)$, indicating number of parts being considered over the number of parts that make one whole.

Fraction Bar: The line separating the numerator and denominator in a fraction, and it indicates division.

Greatest Common Factor (GCF): The largest matching factor of two or more given numbers. It is used to reduce fractions.

Improper Fraction: Any fraction with the numerator larger than the denominator.

Least Common Denominator (LCD): The smallest matching multiple of two or more given numbers. It is used to "boost" fractions. (Also called Least Common Multiple, LCM)

Mixed Number: A whole number and a fraction. (It implies addition of wholes and parts; that is, $3\frac{5}{7}$ is read "three and five sevenths".)

Multiple: (Similar to the "times table.") A multiple of a given number is equal to the given number or greater. Multiples are found by multiplying the given number in turn by 1, 2, 3,... For example, multiples of 4 are 4, 8, 12, 16, …

Numerator: The top number of a fraction. It indicates how many parts of a certain size are represented.

Prime Factor: Factors of a number that are only divisible by 1 and the given number. For example, prime factors of 12 are 1 x 2 x 2 x 3. Some frequently used Prime Numbers are 2, 3, 5, 7, 11, 13.

Product: The result when two numbers are multiplied.

Proper Fraction: Any fraction when the numerator is less than the denominator.

Quotient: The solution to a division problem.

Reducing: Dividing the numerator and the denominator by the same number to get an equivalent fraction. Final answers of most fraction problems should be expressed reduced to "simplest terms"; in other words, the numerator and denominator have no more common factors.

Remainder: The number left after a whole number division problem is complete. When converting an improper fraction to a mixed number, the remainder is the numerator of the fraction.

Sum: the result when two numbers are added.

Whole Number: The Numbers system including 0, 1, 2, 3,….

General Fraction Information
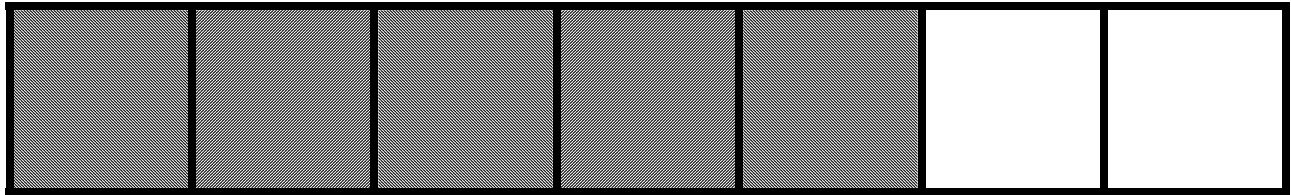
➢ The fraction that represents the above picture is $\dfrac{5}{7}$ and is read "five sevenths". That means that five of the parts are shaded, and it would take seven parts of that size to make a whole.

➢ One whole can be "cut up" into equal size parts; therefore, $1 = \dfrac{13}{13} = \dfrac{9}{9} = \dfrac{123}{123}$, etc.

➢ A whole number can be written as a fraction with a denominator of 1; for example, $2 = \dfrac{2}{1}$. Zero can be written as a fraction using zero as the numerator and any whole number as the denominator, for example, $\dfrac{0}{23}$.

➢ Any whole number may be written as a mixed number by using a zero fraction. For example, $3 = 3\dfrac{0}{42}$.

Mixed Numbers

To convert a mixed number, $5\frac{2}{7}$, to an improper fraction, $\frac{37}{7}$:

Numerator

Whole Number $\longrightarrow$ $5\frac{2}{7} = \frac{37}{7}$
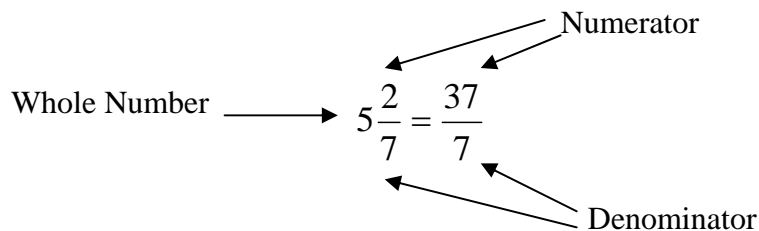
Denominator

$5\frac{2}{7}$	Work in a clockwise direction, beginning with the denominator, (7).
5 x 7 = 35	Multiply the denominator (7) by the whole number, (5)
35 + 2 = 37	Add that product, (35), to the numerator (2) of the fraction.
$\frac{(5\times7)+2}{7} = \frac{37}{7}$	The denominator remains the same for the mixed number and the improper fraction.

Convert to Improper Fractions:

1) $\quad 4\frac{2}{5} =$

2) $\quad 5\frac{3}{8} =$

3) $\quad 2\frac{4}{9} =$

4) $\quad 5\frac{6}{7} =$

5) $\quad 8\frac{1}{8} =$

6) $\quad 14\frac{3}{4} =$

7) $\quad 6\frac{3}{5} =$

8) $\quad 9\frac{1}{10} =$

9) $\quad 16\frac{1}{2} =$

10) $\quad 8\frac{0}{1} =$

11) $\quad 9=$
Hint: See #10

12) $\quad 7\frac{3}{4} =$

13) $\quad 12\frac{5}{9} =$

14) $\quad 10\frac{3}{8} =$

15) $\quad 28\frac{2}{3} =$

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Finding Equivalent Fractions with Larger Denominators
This process is sometimes called "**Boosting**"

$$Example: \frac{5}{8} = \frac{?}{56}$$

$56 \div 8 = 7$ Divide the larger denominator by the smaller to find the factor used to multiply the denominator. (Note: The product of the smaller denominator and the factor is the larger denominator)

$\frac{5}{8} \times \frac{7}{7} = \frac{5 \times 7}{8 \times 7}$ Use this factor to multiply the numerator.

$\frac{5}{8} = \frac{35}{56}$ The result is two equivalent fractions.

Note: Equal denominators are required for addition and subtraction of fractions.

Find the equivalent fractions as indicated:

1) $\frac{2}{5} = \frac{}{15}$

2) $\frac{3}{8} = \frac{}{32}$

3) $\frac{4}{9} = \frac{}{54}$

4) $\frac{6}{7} = \frac{}{49}$

5) $\frac{1}{8} = \frac{}{48}$

6) $\frac{3}{4} = \frac{}{44}$

7) $\frac{3}{5} = \frac{}{45}$

8) $\frac{1}{10} = \frac{}{60}$

9) $\frac{1}{2} = \frac{}{28}$

10) $\frac{10}{100} = \frac{}{700}$

11) $\frac{8}{9} = \frac{}{81}$

12) $\frac{3}{4} = \frac{}{68}$

13) $\frac{5}{9} = \frac{}{108}$

14) $\frac{3}{8} = \frac{}{112}$

15) $\frac{2}{3} = \frac{}{462}$

Equivalent Fractions with Smaller Denominators
Reducing Fractions

Example: Reduce the following fraction to lowest terms

$$\frac{90}{105}$$

There are **three** common **methods,** DO NOT mix steps of the methods!

Method 1:

$$\frac{90 \div 15}{105 \div 15} = \frac{6}{7}$$

The Greatest Common Factor for 90 and 105 is 15. Divide the numerator and the denominator by the GCF, 15.

Method 2:

$$\frac{90 \div 5}{105 \div 5} = \frac{18}{21}$$

Examine the numerator and denominator for any common factors, divide both numerator and denominator by that common factor. Repeat as needed.
  ➢ Both 90 and 105 are divisible by 5.

$$\frac{18 \div 3}{21 \div 3} = \frac{6}{7}$$

  ➢ Both 18 and 21 are divisible by 3.

Method 3:

$$\frac{90}{105} = \frac{2 \times 3 \times 3 \times 5}{7 \times 3 \times 5}$$

Express the numerator and denominator as a product of prime factors.

$$\frac{90}{105} = \frac{2 \times 3 \times (3 \times 5)}{7 \times (3 \times 5)}$$

Divide numerator and denominator by common factors, (3x5)

$$= \frac{2 \times 3}{7} = \frac{6}{7}$$

Multiply remaining factors.

Reduce these fractions.

1) $\dfrac{28}{50} =$

2) $\dfrac{8}{24} =$

3) $\dfrac{30}{54} =$

4) $\dfrac{18}{42} =$

5) $\dfrac{32}{48} =$

6) $\dfrac{36}{54} =$

7) $\dfrac{14}{56} =$

8) $\dfrac{18}{28} =$

9) $\dfrac{36}{216} =$

10) $\dfrac{35}{42} =$

11) $12\dfrac{54}{99} =$

12) $15\dfrac{280}{320} =$

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Improper Fractions

Example: Convert $\dfrac{14}{3}$ to an Improper Fraction

$14 \div 3 = 4$ Remember: Dividend $\div$ Divisor = Quotient

Remainder 2   Divide the numerator (14) by the denominator (3).

$\dfrac{14}{3} = 4\dfrac{2}{3}$ Write the mixed number in the form: $Quotient\,\dfrac{remainder}{divisor}$

Note: Check you answer to see if you can reduce the fraction.

Convert these improper fractions to mixed numbers. *Be sure to reduce when it's possible.*

#11, 12 Hint: how many wholes will there be?

1) $\dfrac{8}{5} =$

2) $\dfrac{18}{7} =$

3) $\dfrac{37}{9} =$

4) $\dfrac{127}{5} =$

5) $\dfrac{32}{9} =$

6) $\dfrac{114}{5} =$

7) $\dfrac{128}{3} =$

8) $\dfrac{401}{3} =$

9) $\dfrac{36}{6} =$

10) $\dfrac{235}{2} =$

11) $15\dfrac{280}{6} =$

12) $8\dfrac{315}{3} =$

13) $\dfrac{54}{8} =$

14) $\dfrac{26}{8} =$

15) $\dfrac{258}{9} =$

Least Common Multiple (LCM)
Used to find the Least Common Denominator (LCD)

Example: Find the LCM of 30 and 45

Note: There are **four** common **methods**; DO NOT mix the steps of the methods!

Method 1	
	Remember that multiples are equal to or larger than the given number.
30, 60, **90**, 120, …	List the multiples of each of the given numbers, in
45, **90**, 135, …	ascending order.
$LCM = 90$	The LCM is the first multiple common to both lists.

Method 2	
45, 90, 135, …	List the multiples of the larger number.
$45 \div 30$ remainder	Divide each in turn by the smaller.
$90 \div 30$ no remainder	The LCM is the multiple that the smaller number
$LCM = 90$	divides without leaving a remainder.

Method 3	
$30 \div 5 = 6$; $45 \div 5 = 9$	Divide both numbers by any common factor, (5 then
$6 \div 3 = 2$; $9 \div 3 = 3$	3). Continue until there are no more common
	factors.
	Note: 2 and 3, the results of the last division have no common factors.
$LCM = 5 \times 3 \times 2 \times 3$	The LCM equals the product of the factors, (5 and
$= 90$	3) and the remaining quotients, (2 and 3).

Method 4	
30 45	
5 x 6 5 x 9	Find the prime factors of each the given numbers.
5 x 2 x 3 5 x 3 x 3	
$30 = 5 \times 2 \times 3$	Write each number as a product of primes using
$45 = 5 \times 3 \times 3$ **Or** $45 = 5 \times 3^2$	exponents, if required.
$LCM = 2 \times 3^2 \times 5$	LCM equals the product of all the factors to the
$= 90$	highest power.

In each exercise, find the LCM of the given numbers.

1)   4   and   18   7)   50   and   75

2)   16   and   40   8)   24   and   30

3)   20   and   28   9)   36   and   45

4)   5   and   8   10)   8   and   20

5)   12   and   18   11)   16   and   20

                                            12)   28,   35,   and   21

6)   12   and   16

Addition and Subtraction of Fractions
with the Same Denominator
To add or subtract fractions, the denominators MUST be the same.

Example 1:
$$\frac{3}{5} - \frac{1}{5} = ?$$

$$\frac{3}{5} - \frac{1}{5} = \frac{3-1}{5}$$

Because both fractions have the same denominator, you may subtract the numerators and keep the denominator.

$$= \frac{2}{5}$$

Example 2:
$$\frac{5}{9} + \frac{7}{9} = ?$$

$$\frac{5}{9} + \frac{7}{9} = \frac{5+7}{9}$$

Because both fractions have the same denominator, you may add the numerators and keep the denominator.

$$= \frac{12}{9}$$

$$= 1\frac{3}{9}$$

Always change improper fractions to a mixed number.

$$= 1\frac{1}{3}$$

Reduce, when possible.

Add or Subtract as indicated.

1. $\dfrac{4}{8} + \dfrac{3}{8}$

2. $\dfrac{7}{10} - \dfrac{1}{10}$

3. $\dfrac{7}{48} + \dfrac{9}{48} + \dfrac{4}{48}$

4. $\dfrac{40}{37} - \dfrac{3}{37}$

5. $\dfrac{10}{13} + \dfrac{4}{13}$

6. $\dfrac{9}{17} + \dfrac{11}{17} + \dfrac{17}{17}$

7. $\dfrac{2}{3} + \dfrac{4}{3} - \dfrac{6}{3}$

8. $\dfrac{7}{6} - \dfrac{5}{6} + \dfrac{1}{6}$

9. $\dfrac{7}{13} + \dfrac{9}{13}$

Addition and Subtraction of Fractions
with Different Denominators
Remember: In order to add or subtract fractions, the denominators MUST be the same.

Example:

$$\frac{2}{3}+\frac{3}{8}=?$$

LCM = 24   Find the LCM

$$\frac{2}{3}\times\frac{8}{8}=\frac{16}{24}$$ Write the problem vertically.

$$+\quad\frac{3}{8}\times\frac{3}{3}=\frac{9}{24}$$ Find the equivalent fractions with the LCM as a denominator.

$$\frac{25}{24}$$ Add the fractions with the same denominator.

$$\frac{25}{24}=1\frac{1}{24}$$ Remember to write as a mixed number and reduce when possible!

Add or Subtract:

1) $\frac{7}{8}+\frac{3}{4}$

2) $\frac{7}{8}-\frac{3}{4}$

3) $\frac{11}{12}+\frac{17}{18}$

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

5) $\frac{15}{24}-\frac{10}{27}$

6) $\frac{7}{12}+\frac{5}{16}$

7) $\frac{16}{27}-\frac{5}{24}$

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

9) $\frac{11}{4}+\frac{23}{18}$

10) $\frac{29}{8}+\frac{9}{7}$

11) $2\frac{13}{35}-1\frac{5}{14}$

12) $\frac{2}{3}+\frac{1}{21}-\frac{2}{7}$

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Subtraction of Fractions with Borrowing

Example 1: $7 - 1\dfrac{1}{3} = \,?$

Example 2: $5\dfrac{1}{3} - 2\dfrac{5}{6} = \,?$

Note: There are two common methods; DO NOT mix the steps of the methods!

Method 1 *Example 1* $$\begin{aligned}7 \;&= 6\frac{3}{3}\\[4pt]-\;1\frac{1}{3} \;&= \;1\frac{1}{3}\\ \hline &\;5\frac{2}{3}\end{aligned}$$	**Subtraction with Borrowing** Write problem vertically Cannot subtract fraction from whole without finding common denominator. Borrow one whole from 7 and express as $\dfrac{LCD}{LCD}.\;\left(1 = \dfrac{3}{3}\right)$ Subtract numerators and whole numbers.
Example 2 $$\begin{aligned}5\frac{1}{3} = 5\frac{2}{6} \;&= 4\frac{8}{6}\\[4pt]-\;2\frac{5}{6} = 2\frac{5}{6} \;&= 2\frac{5}{6}\\ \hline &\;2\frac{3}{6} = 2\frac{1}{2}\end{aligned}$$	Write problem vertically and find LCD Cannot subtract 5 from 2. Borrow one whole from 5, $\left(4\dfrac{6}{6}\right)$ and add $\left(5\dfrac{2}{6} = 4\dfrac{6+2}{6}\right)$. Subtract numerators and whole numbers; reduce as needed.
Method 2 *Example 1:* $$\begin{aligned}7 \;&= \frac{21}{3}\\[4pt]-\;1\frac{1}{3} \;&= \;\frac{4}{3}\\ \hline &\;\frac{17}{3} = 5\frac{2}{3}\end{aligned}$$	**Subtraction Using Improper Fractions** Write the problem vertically. Convert the whole numbers and mixed numbers to improper fractions using the LCD. Subtract $\left(\dfrac{21-4}{3}\right)$ and convert improper fraction to mixed number.
Example 2: $$\begin{aligned}5\frac{1}{3} = 5\frac{2}{6} \;&= \frac{32}{6}\\[4pt]-\;2\frac{5}{6} = 2\frac{5}{6} \;&= \frac{17}{6}\\ \hline &\;\frac{15}{6} = 2\frac{3}{2}\\[4pt]&\;2\frac{3}{2} = 2\frac{1}{2}\end{aligned}$$	Write problem vertically and find the LCD. Change the mixed numbers to improper fractions. Subtract the numerators. Convert to a mixed number. Reduce.

Subtract:

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

2) $7 \; - \; 1\frac{1}{6}$

3) $10 \; - \; 4\frac{5}{6}$

4) $3\frac{5}{8} \; - \; 2\frac{7}{8}$

5) $1\frac{1}{8} \; - \; \frac{3}{4}$

6) $3\frac{5}{12} \; - \; 1\frac{15}{16}$

7) $8 \; - \; 6\frac{4}{5}$

8) $4\frac{3}{8} \; - \; 3\frac{5}{6}$

9) $17 \; - \; 4\frac{5}{9}$

10) $5\frac{5}{18} \; - \; 1\frac{3}{4}$

11) $5\frac{2}{7} \; - \; 3\frac{3}{8}$

12) $18 \; - \; 1\frac{7}{16} \; - \; \frac{7}{12}$

Multiplication of Fractions

Example:

$$\frac{3}{10} \times 3\frac{5}{6}$$

Note: LCD is not needed to multiply fractions.

$3\frac{5}{6} = \frac{(6 \times 3) + 5}{6}$ Change mixed numbers to improper fractions

$\frac{3}{10} \times \frac{23}{6} = \frac{1 \times 23}{10 \times 2}$ Before multiplying, reduce by dividing any numerator with any denominator with a common factor. (3 and 6 have a common factor of 3)

$\frac{1 \times 23}{10 \times 2} = \frac{23}{20}$ Multiply numerators and denominators

$\frac{23}{20} = 1\frac{3}{20}$ Convert improper fractions to mixed numbers.

Multiply:

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

5) $\frac{10}{11} \times 1\frac{7}{15}$

9) $9\frac{7}{8} \times \frac{4}{5}$

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

6) $4\frac{3}{5} \times 15$

10) $7\frac{9}{10} \times 1\frac{1}{4}$

3) $6 \times 1\frac{1}{9}$

7) $3\frac{3}{8} \times 2\frac{2}{9}$

11) $18 \times 1\frac{3}{7} \times \frac{4}{15}$

4) $2\frac{1}{6} \times 1\frac{1}{2}$

8) $34 \times 2\frac{3}{17}$

12) $3\frac{1}{5} \times 1\frac{5}{6} \times \frac{3}{8}$

Division of Fractions

Example:

$$2\frac{3}{4} \div 2\frac{3}{8} \qquad \textbf{OR} \qquad \frac{2\frac{3}{4}}{2\frac{3}{8}}$$

Note: One fraction divided by another may be expressed in either way shown above. Also, LCD is not needed to divide fractions.

$2\frac{3}{4} = \frac{11}{4}$ and $2\frac{3}{8} = \frac{19}{8}$ Convert mixed numbers to improper fractions

$\frac{11}{4} \div \frac{19}{8} = \frac{11}{4} \times \frac{8}{19}$ Invert the divisor $\left(\frac{19}{8}\right)$. (Turn the fraction after the division sign upside down)

$\frac{11 \times 8}{4 \times 19} = \frac{11 \times 2}{1 \times 19}$ Reduce if possible. (4 and 8 have a common factor)

$\frac{11 \times 2}{1 \times 19} = \frac{22}{19}$ Multiply numerators and denominators

$\frac{22}{19} = 1\frac{3}{19}$ Convert to a mixed number and reduce if needed.

Divide these fractions.   Reduce to lowest terms!

1) $\frac{5}{6} \div \frac{1}{2}$

2) $\frac{3}{4} \div \frac{3}{7} =$

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

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

5) $\frac{1}{2} \div 6 =$

6) $2\frac{1}{4} \div 3 =$

7) $3\frac{1}{7} \div 2\frac{5}{14} =$

8) $\frac{2\frac{5}{8}}{1\frac{7}{8}}$

9) $4\frac{1}{2} \div 1\frac{3}{4} =$

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Some Fraction Word Problems

Example 1:

One day Ashley biked $\frac{3}{4}$ of a mile before lunch and $\frac{7}{8}$ of a mile after lunch. How far did she cycle that day?

Note: this problem is asking you to add the distances traveled.

$\frac{3}{4} + \frac{7}{8}$
To add fractions, find a LCD (8).

Add the numerators; keep the denominators.

$\frac{6}{8} + \frac{7}{8}$

Convert improper fraction to a mixed number; reduce if needed.

$\frac{13}{8} = 1\frac{5}{8}$

Ashley cycled $1\frac{5}{8}$ miles that day.

Example 2:

A tailor needs $3\frac{1}{4}$ yards of fabric to make a jacket. How many jackets can he make with $19\frac{1}{2}$ yards of fabric?

Note: this problem is asking you to divide.

$19\frac{1}{2} \div 3\frac{1}{4}$
To divide fractions, convert mixed numbers to improper fractions.

$\frac{39}{2} \div \frac{13}{4}$

Invert the divisor and reduce if possible, (39 and 13 have a common factor, as do 2 and 4).

$\frac{39}{2} \times \frac{4}{13} = \frac{3 \times 2}{1 \times 1}$

Multiply numerators and denominators.

$\frac{3}{1} = 3$

The tailor can make 3 jackets from $19\frac{1}{2}$ yards of fabric.

Solve the following problems.

1. An empty box weighs $2\frac{1}{4}$ pounds. It is then filled with $16\frac{2}{3}$ pounds of fruit. What is the weight of the box when it is full?

2. Yanni is making formula for the baby. Each bottle contains $6\frac{2}{5}$ scoops of formula. The formula container holds 320 scoops of formula. How many bottles of formula can Yanni make?

3. Miguel bought $2\frac{1}{4}$ pounds of hamburger, $1\frac{1}{5}$ pounds of sliced turkey, and 2 pounds of cheese. What was the total weight of all of his purchases?

4. Sheila had 8 yards of fabric. She used $2\frac{1}{4}$ yards to make a dress. How much fabric does she have left?

5. A father leaves his money to his four children. The first received $\frac{1}{3}$, the second received $\frac{1}{6}$, and the third received $\frac{2}{5}$. How much did the remaining child receive? (Hint: You can think of father's money as one whole.)

6. Find the total perimeter (sum of the sides) of an equilateral triangle, (triangle with equal sides), if each side measures $2\frac{1}{4}$ inches.

Answers to Fractions Competency Packet

p. 6	p. 7	p. 8	p. 9	p. 11
1) $\dfrac{22}{5}$	1) 6	1) $\dfrac{14}{25}$	1) $1\dfrac{3}{5}$	1) 36
2) $\dfrac{43}{8}$	2) 12	2) $\dfrac{1}{3}$	2) $2\dfrac{4}{7}$	2) 80
3) $\dfrac{22}{9}$	3) 24	3) $\dfrac{5}{9}$	3) $4\dfrac{1}{9}$	3) 140
4) $\dfrac{41}{7}$	4) 42	4) $\dfrac{3}{7}$	4) $25\dfrac{2}{5}$	4) 40
5) $\dfrac{65}{8}$	5) 6	5) $\dfrac{2}{3}$	5) $3\dfrac{5}{9}$	5) 36
6) $\dfrac{59}{4}$	6) 33	6) $\dfrac{2}{3}$	6) $22\dfrac{4}{5}$	6) 48
7) $\dfrac{33}{5}$	7) 27	7) $\dfrac{1}{4}$	7) $42\dfrac{2}{3}$	7) 150
8) $\dfrac{91}{10}$	8) 6	8) $\dfrac{9}{14}$	8) $133\dfrac{2}{3}$	8) 120
9) $\dfrac{33}{2}$	9) 14	9) $\dfrac{1}{6}$	9) 6	9) 180
10) $\dfrac{8}{1}$	10) 70	10) $\dfrac{5}{6}$	10) $117\dfrac{1}{2}$	10) 40
11) $\dfrac{9}{1}$	11) 72	11) $12\dfrac{6}{11}$	11) $61\dfrac{2}{3}$	11) 80
12) $\dfrac{31}{4}$	12) 51	12) $15\dfrac{7}{8}$	12) 113	12) 420
13) $\dfrac{113}{9}$	13) 60		13) $6\dfrac{3}{4}$	
14) $\dfrac{83}{8}$	14) 42		14) $3\dfrac{1}{4}$	
15) $\dfrac{86}{3}$	15) 308		15) $28\dfrac{2}{3}$	

p. 12	p. 13	p. 15	p. 16	p. 17
1) $\dfrac{7}{8}$	1) $1\dfrac{5}{8}$	1) $2\dfrac{2}{3}$	1) 3	1) $1\dfrac{2}{3}$
2) $\dfrac{3}{5}$	2) $\dfrac{1}{8}$	2) $5\dfrac{5}{6}$	2) 4	2) $1\dfrac{3}{4}$
3) $\dfrac{5}{12}$	3) $1\dfrac{31}{36}$	3) $5\dfrac{1}{6}$	3) $6\dfrac{2}{3}$	3) $2\dfrac{1}{7}$
4) 1	4) $\dfrac{29}{35}$	4) $\dfrac{3}{4}$	4) $3\dfrac{1}{4}$	4) $1\dfrac{1}{2}$
5) $1\dfrac{1}{13}$	5) $\dfrac{55}{216}$	5) $\dfrac{3}{8}$	5) $1\dfrac{1}{3}$	5) $\dfrac{1}{12}$
6) $2\dfrac{3}{17}$	6) $\dfrac{43}{48}$	6) $1\dfrac{23}{48}$	6) 69	6) $\dfrac{3}{4}$
7) $\dfrac{0}{3}$	7) $\dfrac{83}{216}$	7) $1\dfrac{1}{5}$	7) $7\dfrac{1}{2}$	7) $1\dfrac{1}{3}$
8) $\dfrac{1}{2}$	8) $1\dfrac{5}{8}$	8) $\dfrac{13}{24}$	8) 74	8) $1\dfrac{2}{5}$
9) $1\dfrac{3}{13}$	9) $4\dfrac{1}{36}$	9) $12\dfrac{4}{9}$	9) $7\dfrac{9}{10}$	9) $2\dfrac{4}{7}$
	10) $4\dfrac{51}{56}$	10) $3\dfrac{19}{36}$	10) $9\dfrac{7}{8}$	
	11) $1\dfrac{1}{70}$	11) $1\dfrac{51}{56}$	11) $6\dfrac{6}{7}$	
	12) $\dfrac{3}{7}$	12) $15\dfrac{47}{48}$	12) $2\dfrac{1}{5}$	

P. 19

1) $18\dfrac{11}{12}$ pounds   3) $5\dfrac{9}{20}$ pounds   5) $\dfrac{1}{10}$ of the money

2) 50 bottles   4) $5\dfrac{3}{4}$ yards   6) $6\dfrac{3}{4}$ inches