Arithmetic

Work-text 4

Fourth Edition

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abeka
Traditional ARITHMETIC SERIES

About the Text

Arithmetic 4 contains a variety of exercises involving new/review material in each lesson. The workbook includes 170 lessons (excluding tests) and Supplementary Exercises. The handbook at the end of the book contains facts, rules, and measures which are given throughout the workbook.

Although all new material is presented at top of a workbook page, the workbook is not designed to be used without a teacher. Students need to *hear* a thorough explanation of each concept and *see* procedures demonstrated step by step by the teacher.

Arithmetic 4 Curriculum/Lesson Plans, available separately or as part of the Grade 4 Curriculum, and the Teacher Edition provide complete daily plans for teaching, reviewing, and testing. The Teacher Edition also includes solutions to all exercises in the text. *Student Tests and Speed Drills* is correlated with the work-text.

Learning Objectives

The unit approach is not used. After each skill or concept is introduced, the mastering process continues throughout the course so that it is not forgotten.

1. Recognize place value of numbers through millions.
2. Review addition facts; use to work/check addition problems with carrying.
3. Review subtraction facts; use to work/check subtraction problems with borrowing.
4. Know 0–12 multiplication tables/use to work multiplication problems with carrying. Problems may have up to three digits in second factor.
5. Know 1–12 division tables and use to work/check division problems. Problems may have up to two digits in the divisor. Be able to use estimation when finding quotient.
6. Know terminology for the 4 processes.
7. Solve story problems with multiple steps.
8. Average numbers.
9. Estimate answers.
10. Know English/metric measures, how to convert measures, and how to solve measurement equations.
11. Know Roman numerals 1–1,000.
12. Know fraction terminology/how to solve problems containing fractions. Add/subtract fractions and mixed numbers with any denominator. Recognize proper/improper fractions. Change mixed numbers to improper fractions/change improper fractions to mixed numbers. Reduce answers in fraction problems to lowest terms. Subtract fractions involving borrowing. Write a remainder as a fraction. Multiply fractions using cancellation. Write a fraction as a decimal.
13. Factor numbers to find the greatest common factor.
14. Find the least common multiple shared by two or more numbers.
15. Know 2, 3, 4, 5, 9, and 10 divisibility rules.
16. Recognize place value of decimals. Write a decimal as a fraction. Add/subtract decimals.
17. Make correct change.
18. Read a thermometer.
19. Solve equations containing an unknown number.
20. Recognize/read pictographs, bar graphs, and line graphs.
21. Draw/read scale drawings of maps.
22. Recognize/draw some geometric shapes and figures.
23. Find perimeter of a polygon. Find perimeter of a rectangle/square using the correct formula.
24. Find area of a rectangle/square using the correct formula.

***Arithmetic 4* Teacher Edition**
For use with fourth edition of text
Author: J. Howe; *Edition Editors:* N. Sleeth, M. Hedquist

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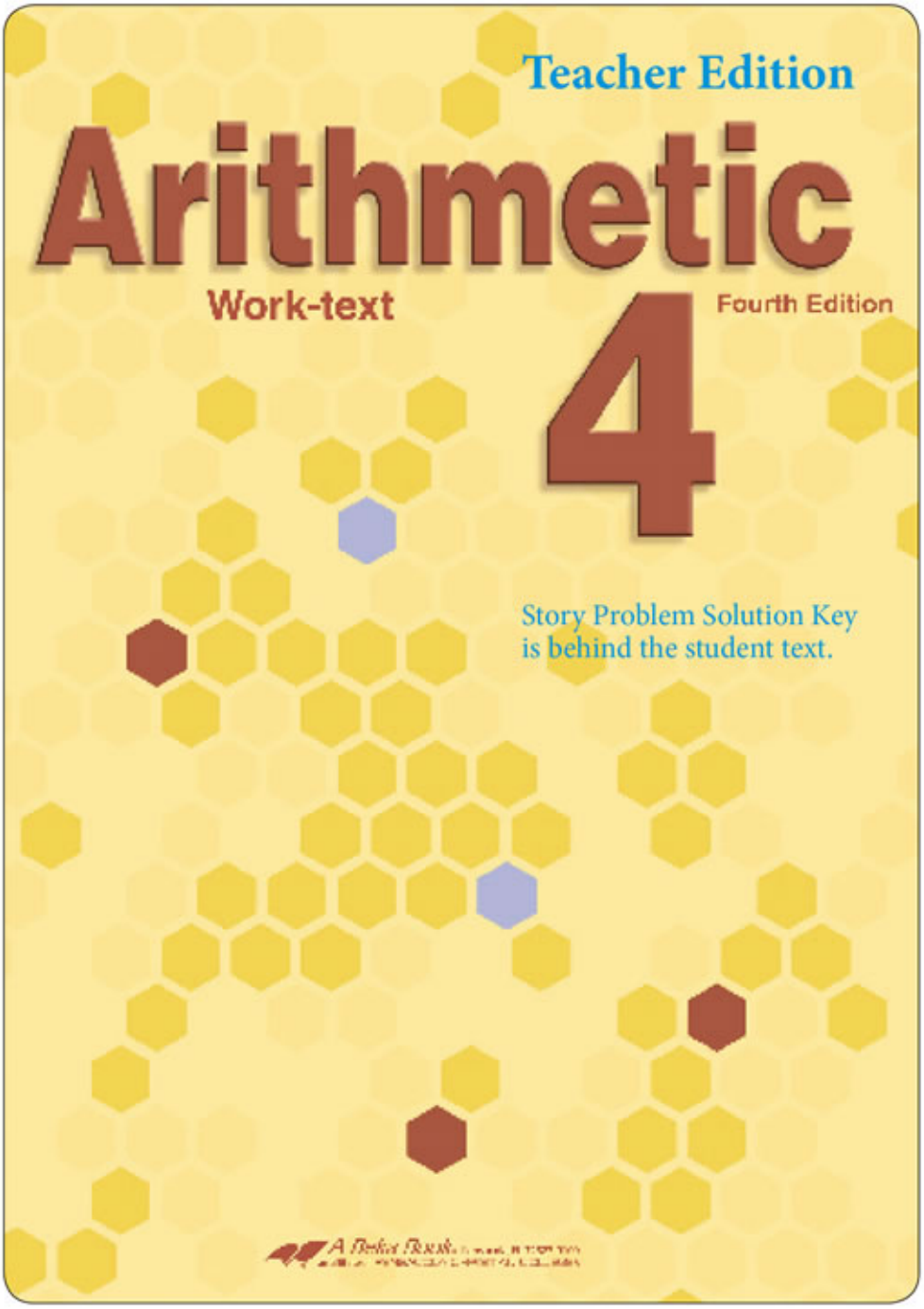

Arithmetic is...

- studying one aspect of the order of the real world and indirectly learning more about the God Who created the world using mathematics.
- learning to see the addition/multiplication tables as part of the truth/order that God has built into reality.
- knowing that there is a right answer.
- working hard to get the right answer.
- learning to go from the concrete to the abstract, from the particular to the general, from content to concept.
- learning to see relationships between one truth and another.
- learning to be precise/exact in thinking.
- learning to apply mathematics skillfully in order to function in daily life.
- learning to believe in absolutes (2+2 always equals 4).
- establishing the extremely important skill of learning things by memory.
- learning to be fast/accurate in thinking.
- seeing how things work together.
- being prepared.
- finishing the job.
- working at a set pace.
- participating in healthy competition.
- learning to be thorough, orderly, careful, alert, obedient, persistent, cooperative, honest.
- learning to master a received body of knowledge and apply it as one way to obey the command of Genesis 1:28 to subdue the earth/exercise dominion over it.

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Teaching Materials

Student Materials

Arithmetic 4 Work-text
Tests and Speed Drills

Teacher Materials

Arithmetic 4
Teacher Edition
Tests and Speed Drills Key
Curriculum
Addition Flashcards
Subtraction Flashcards
Multiplication Flashcards
Division Flashcards
Concept Cards 3/4
Rapid Calculation Drills A
Teach-a-Coin Set
Felt Fractional Circles
Arithmetic 3–8 Tables and Facts Charts
Arithmetic 3–8 Charts

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- Adding whole numbers with carrying
- Story problems
- Money
- Subtracting whole numbers with borrowing
- Multiplying whole numbers with carrying
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- Dividing whole numbers and money
- English linear, liquid, and weight measures
- Converting measures
- Measurement equations
- Measuring to the nearest quarter inch
- Averaging
- Concept of fractions
- Fractional parts of a group
- Two-digit division
- Remainders as fractions
- Adding and subtracting fractions with a common denominator
- Mixed numbers

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- Factoring
- Measures of time
- Measuring to the nearest centimeter
- Reducing fractions
- Proper and improper fractions
- Fraction bar
- Changing improper fractions
- Sums containing improper fractions
- Dry measures
- Equivalent fractions
- Least common multiples and denominators
- Adding and subtracting fractions with uncommon denominators
- Roman numerals
- Estimation
- Whole numbers as improper fractions
- Subtracting fractions with borrowing

Arithmetic 4
Fourth Edition

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A Beka Book, a Christian textbook ministry affiliated with Pensacola Christian College, is designed to meet the need for Christian textbooks and teaching aids. The purpose of this publishing ministry is to help Christian schools reach children and young people for the Lord and train them in the Christian way of life.

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Teacher Information

Time Allotment

In the *Abeka* 4th grade curriculum, arithmetic is taught/practiced for 45–50 minutes.

Teaching Procedure

Arithmetic class begins with 8–12 minutes of *oral drill.* The *written speed drill* follows oral drill. Speed drills are exchanged/checked; speed drills are recorded once a week as a quiz grade.

After a thorough review time, *new concepts* are introduced/practiced. The time allotted depends on the difficulty/newness of the concept.

Story problems are included in the Arithmetic 4 Curriculum to teach students to think/plan solving of problems by themselves.

The *Review/Boardwork* time includes a spiral review of important concepts/facts presented throughout the year. This review time helps students master the concepts/facts, and also provides opportunity for them to work at the chalkboard.

Additional Practice problems are included in each lesson. *Homework* problems are included three times a week for Lessons 6–168.

Tests and Speed Drills

Four speed drills and either a test or a quiz are included in Student Tests and Speed Drills for each week. Answers/point values are available in the Tests and Speed Drills Key.

Lessons 91–130 . . . . . pages 165–236

- Subtracting fractions with borrowing and uncommon denominators
- Time lapse
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- Multiplying fractions
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- Solving equations
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- Geometric shapes
- Concept of perimeter
- Perimeter of squares and rectangles
- Concept of area
- Area of squares and rectangles
- English units of square measures

Supplementary Exercises . . . . . pages 307–342
Handbook . . . . . pages 343–350

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Introduce story problems. Ex. 5

- Teach these six questions as procedure for solving story problems. Go through questions several times with class.

  What does the story problem tell us?

  What does the story problem ask us?

  Are there any clue words or rules that help us solve the problem?

  Are there any missing facts?

  Are there any unnecessary numbers that are not needed?

  What process should we use to solve this problem?

- B Read story problem 5*a*. Have students answer six questions as procedure for working problem. Discuss setup given under Ex. 5. Use setup on ckbd to help with explanation.

Note: Students use notebook paper for story problems. You may choose to let students use the same sheet for 1 week before you collect it. In this case, students need to be careful not to lose or misplace their story problem answer sheets.

- Students read/work story problems *b–c*. Use six questions as procedure for solving. Point out clue words *altogether/change*. Circulate around classroom to assist students who need help.
- Go over commonly used clue words that students will see throughout year:

  Add: altogether, both, in all, sum, total

  Subtract: more than, difference, how much more, how many more, less than, how many are left

  Multiply: each, times, product

5. Study the first problem and solve the other two problems. Story problems should be solved neatly on your notebook paper.

Study to shew thyself approved unto God, a workman that needeth not to be ashamed, rightly dividing the word of truth. —2 Tim. 2:15

a. In the library there are 5,329 science books, 7,314 history books, and 13,589 fiction books. How many books are there in all?

Setup:
5,329 *science books*
7,314 *history books*
+ 13,589 *fiction books*
(26,232) *books in all*

b. Mrs. Neill baked 36 chocolate chip cookies, 48 raisin cookies, and 40 peanut butter cookies for her Sunday school class. How many cookies did she bake altogether? (124) cookies altogether (See end of text for solutions to all story problems.)

c. Dylan spent $4.78 on a biography of Hudson Taylor, missionary to China. How much change did he get from five dollars? ($.22) change

Review

6. Solve these addition problems. Watch for carrying.

a.	b.	c.	d.	e.
9,785	6,985	27,352	89,321	97,814
4,632	1,197	95,787	65,297	49,263
+8,972	+3,059	+16,259	+23,859	+58,269
23,389	11,241	139,398	178,477	205,346

f.	g.	h.	i.	j.	k.
97	62	432	329	6,854	29,302
53	58	578	657	9,267	78,416
78	29	289	283	8,349	99,875
+49	+17	+478	+495	+7,516	+63,294
277	166	1,777	1,764	31,986	270,887

Extra Practice

7. Read and write these numbers. Place commas correctly. *(optional or homework)*

a. 43 million, 297 thousand, 621 — 43,297,621

b. 98 million, 14 thousand, 387 — 98,014,387

c. 10 million, 100 thousand, 100 — 10,100,100

d. 95 million, 892 thousand, 621 — 95,892,621

8. Add carefully. *(optional or homework)*

a.	b.	c.	d.	e.
973	802	3,025	5,094	93,287
295	357	8,976	8,721	56,539
+654	+649	+5,413	+6,501	+87,458
1,922	1,808	17,414	20,316	237,284

Review addition with carrying. Ex. 6

- C Work/explain concept of carrying. Class answers Ex. 6. Send each row to ckbd to do 1 problem. Circulate around room to check work.

Homework Ex. 7–8

Note: Homework is optional for L 1–5. If homework (hmwk) is not assigned 1st week, hmwk section is optional class practice. Train students to take hmwk out of desks immediately at beginning of class and hold up their hmwk by row. Write the names of any students with incomplete homework. Have students get out a pen to check their work. Quickly call out all answers; students mark incorrect answers. Recognize students who missed 0 or 1.

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Introduce two-digit multiplication. Ex. 1–3

- ☐ Work 1st problem as students explain. Students do Ex. 1 *a–e*.
- ☐ Work 2nd problem as you explain how to multiply by a 2-digit factor.

```
  2 3
   25
 × 46
  150
+1000
 1,150
```

1. **Cover 4 in 46. Multiply 6 times 5 and 6 times 2 as usual, remembering to carry when necessary.**
2. **Cover 6 in 46. Multiply 4 times 5 and 4 times 2. The 0 in the product of 4 times 5 must be in the tens' place. When we multiply by the 4, we are really multiplying by 40 since it is in the tens' place.** If a student has trouble remembering to begin the 2nd partial product in the tens' place, have him put a 0 in the ones' place of the 2nd partial product.
3. Explain that the two products are partial products and must be added to get the product.

Work other problems on ckbd step by step as class follows along.

- Read/discuss **box.** Students do remaining problems in Ex. 1/problems in Ex. 2–3. You may need to work some mult. problems on ckbd as students work in text.

Name _____ Date _____

Two-Digit Multipliers

Steps in multiplying by a two-digit factor:

1. Multiply the top factor 27 by the 1 in the bottom factor 51.
2. Multiply 27 by 5 and leave the space below the 7 empty because you are multiplying by a tens' digit.
3. Add the partial products.

```
  27   factor
× 51   factor
  27   partial product
+135   partial product
1,377  product
```

Class Practice

1. Find the products. (For additional problems, see Supplementary Exercises, p. 318.)

a.	b.	c.	d.	e.
4,783 × 6 = 28,698	9,504 × 7 = 66,528	8,729 × 3 = 26,187	6,041 × 6 = 36,246	9,487 × 5 = 47,435

f.	g.	h.	i.	j.
75 × 37 = 525 + 225 = 2,775	97 × 25 = 485 + 194 = 2,425	67 × 43 = 201 + 268 = 2,881	19 × 27 = 133 + 38 = 513	65 × 48 = 520 + 260 = 3,120

2. Work. Label *a*.

a.
```
 97   factor
×15   factor
485   partial product
+97   partial product
1,455 product
```

b.
```
 24
×32
 48
+72
768
```

c.
```
 47
×26
282
+94
1,222
```

3. Answer quickly.

a.	b.	c.	d.	e.
6 × 7 = 42	4 × 3 = 12	12 × 5 = 60	11 × 6 = 66	9 × 7 = 63

f.	g.	h.	i.	j.
6 × 6 = 36	7 × 3 = 21	9 × 4 = 36	12 × 6 = 72	10 × 5 = 50

k. 5 × 7 = 35 **l.** 3 × 9 = 27 **m.** 7 × 4 = 28

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Introduce division. Ex. 1–2

- ***Arith Chart* 3:** Teach 5 steps of division. Show how each step was used to find quotient. Students stand and say 5 steps of div. in order several times. Students need to memorize steps.
- ***Concept Card* 19:** Introduce terms in div. problem.
- ☐ Work 1st problem for students. Emphasize 5 steps in div.
  1. **Divide 2 into 6. Say, *How many 2s are in 6?* or *What number times 2 equals 6?* Write quotient of 3 above 6.** (Help students see that div. is opposite of mult. When they div., they are finding missing factor.)
  2. **Mult. the number last put in quotient (3) times divisor 2. Place product 6 below dividend 6.**
  3. **Subt. 6 from 6 to get 0.**
  4. **Compare difference 0 with divisor 2. The difference must be less than divisor. If difference is the same number or greater than divisor, quotient is wrong.**
  5. **Bring down next number in dividend. Since there is nothing to bring down, problem is finished.**

  Work 2nd problem for students, again emphasizing 5 steps.
- Read/discuss **box.** Students do Ex. 1–2. You may need to work a few problems on ckbd as students work in text.

Discuss story problems. Ex. 3

- Students do Ex. 3.

Note: Most days students should work story problems on ckbd.

Name _____ Date _____

Introduction to Division

Rule: The five steps in simple division are **divide** (÷), **multiply** (×), **subtract** (−), **compare** (c), and **bring down** (↓).

Fact: The number being divided is the **dividend.** The dividend is divided by the **divisor.** The answer is the **quotient.**

Steps in working a division problem:

1. Divide 3 into 9 (3).
2. Multiply 3 × 3 (9).
3. Subtract 9 − 9 (0).
4. The difference should be less than the divisor. Compare 0 with 3. 0 is less than 3.
5. Bring down the next number in the dividend. Since there is no number to bring down, the problem is finished.

divisor 3) 9 dividend; × 3 quotient; − 9; 0

Class Practice

1. Write the correct term in each blank. Spell correctly. (For additional problems, see Supplementary Exercises, pp. 319–321.)

a. divisor 3) 9 dividend; × 3 quotient; − 9; 0

b. divisor 4) 8 dividend; × 2 quotient; − 8; 0

2. Divide. Show all your work.

a. 2) 6; × 3; − 6; 0

b. 4) 4; × 1; − 4; 0

c. 3) 6; × 2; − 6; 0

d. 2) 8; × 4; − 8; 0

e. 1) 6; × 6; − 6; 0

f. 3) 3; × 1; − 3; 0

g. 4) 4; × 1; − 4; 0

h. 2) 4; × 2; − 4; 0

3. Solve these story problems.

a. How much did Juan earn by selling 135 apples at 35¢ each?

$47.25 earned

b. Keri spent $8.76 on a biography of William Carey, missionary to India. How much change did she receive from $10.00?

$1.24 change

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Introduce reducing fractions. Ex. 1–3

- ***Felt Fractional Circles:*** Show $\frac{1}{2}$ and $\frac{2}{4}$. Use a story such as this to introduce reducing fractions. **John and Paul both had pizza for lunch. John ate $\frac{1}{2}$ of a small pizza that was cut into halves. Paul ate $\frac{2}{4}$ of a small pizza that was cut into fourths. Who ate more pizza?** Show with circles that boys ate same amount. Write $\frac{2}{4} = \frac{1}{2}$ on ckbd. Point to $\frac{1}{2}$ and say that this fraction is said to be reduced to lowest terms. Point out that numbers 1 and 2 are less than numbers 2 and 4, therefore making $\frac{1}{2}$ having smaller terms. Be sure that students understand that even though terms are smaller, fraction size remains same.
- Use ***Felt Fractional Circles*** to show that $\frac{2}{6}$ is same as $\frac{1}{3}$.
- ☐ Point to $\frac{2}{4}$. Students find greatest common factor for 2 and 4. Tell them that they have been finding g.c.f. for a reason. We can use g.c.f. to reduce fractions to lowest terms. **To reduce fractions to lowest terms, divide the numerator and denominator by the greatest common factor. The greatest common factor is the largest number that will evenly divide into the numerator and the denominator.** Div. both terms by 2 to get $\frac{1}{2}$. Students should remember from demonstration that $\frac{1}{2}$ and $\frac{2}{4}$ name same amount and are equal fractions. You may want to point out that when we div. both terms by 2, we are div. by $\frac{2}{2}$ which is equal to 1. Students should understand that any number div. by 1 gives us same number.

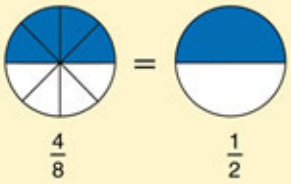
Continue to reduce fractions on ckbd by finding g.c.f. (Tell students that one fraction cannot be reduced.)

- ***Concept Cards* 80–84:** Show fronts of cards; students reduce by div. each term by 2. Emphasize again that fractions are equal.
- Read/discuss **box.** Students do Ex. 1–3. As students do Ex. 2–3, they must check answers to be sure fractions are in lowest terms. Now that they have learned to reduce, they are responsible to make sure all fractional answers are reduced to lowest terms. You may want to work a few problems with class. Send students to ckbd to work some problems.

Name _____ Date _____

Reducing Fractions

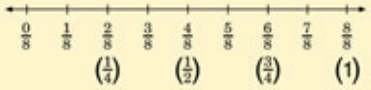
Rule: To reduce a fraction to lowest terms **divide** the numerator and the denominator by the **greatest common factor.** The greatest common factor is the largest number that will evenly divide into the numerator and the denominator.



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

$\frac{4}{8} = \frac{4 \div 4}{8 \div 4} = \frac{1}{2}$

The g.c.f. of 4 and 8 is 4.



Fact: To reduce a fraction does not mean to make it smaller in size. A fraction reduced to lowest terms is a fraction having the smallest numbers possible used in the numerator and the denominator.

Class Practice

1. Reduce these fractions to lowest terms after determining the greatest common factor. (For additional problems, see Supplementary Exercises p. 327.)

a. $\frac{4}{8} = \frac{1}{2}$ b. $\frac{2}{6} = \frac{1}{3}$ c. $\frac{5}{10} = \frac{1}{2}$ d. $\frac{3}{9} = \frac{1}{3}$

e. $\frac{8}{24} = \frac{1}{3}$ f. $\frac{6}{10} = \frac{3}{5}$ g. $\frac{5}{15} = \frac{1}{3}$ h. $\frac{2}{4} = \frac{1}{2}$

2. Add. Reduce the fractions if necessary.

a. $\begin{array}{r} 976 \\ 432 \\ 509 \\ +\ 658 \\ \hline 2,575 \end{array}$

b. $\begin{array}{r} 14\frac{1}{18} \\ 28\frac{1}{18} \\ +\ 39\frac{1}{18} \\ \hline 81\frac{3}{18} = 81\frac{1}{6} \end{array}$

c. $\begin{array}{r} \$47.08 \\ +\ 29.95 \\ \hline \$77.03 \end{array}$

d. $\begin{array}{r} 673 \\ 951 \\ 428 \\ +\ 791 \\ \hline 2,843 \end{array}$

e. $\begin{array}{r} 281\frac{1}{12} \\ 956\frac{1}{12} \\ 314\frac{1}{12} \\ +\ 285\frac{1}{12} \\ \hline 1,836\frac{4}{12} = 1,836\frac{1}{3} \end{array}$

3. Subtract. Reduce the fractions if necessary.

a. $\begin{array}{r} \$90.35 \\ -\ 87.39 \\ \hline \$\ \ 2.96 \end{array}$

b. $\begin{array}{r} 63\frac{9}{13} \\ -\ 27\frac{4}{13} \\ \hline 36\frac{5}{13} \end{array}$

c. $\begin{array}{r} 802\frac{5}{8} \\ -\ 146\frac{3}{8} \\ \hline 656\frac{2}{8} = 656\frac{1}{4} \end{array}$

d. $\begin{array}{r} 1,625 \\ -\ 1,487 \\ \hline 138 \end{array}$

e. $\begin{array}{r} \frac{9}{10} \\ -\ \frac{4}{10} \\ \hline \frac{5}{10} = \frac{1}{2} \end{array}$

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Addition Fact Families (cont.)

Ten Family

1	2	3	4	5	6	7	8	9
+ 9	+ 8	+ 7	+ 6	+ 5	+ 4	+ 3	+ 2	+ 1

Eleven Family

2	3	4	5	6	7	8	9
+ 9	+ 8	+ 7	+ 6	+ 5	+ 4	+ 3	+ 2

Twelve Family

3	4	5	6	7	8	9
+ 9	+ 8	+ 7	+ 6	+ 5	+ 4	+ 3

Thirteen Family

4	5	6	7	8	9
+ 9	+ 8	+7	+ 6	+ 5	+ 4

Fourteen Family

5	6	7	8	9
+ 9	+ 8	+ 7	+ 6	+ 5

Fifteen Family

6	7	8	9
+ 9	+ 8	+ 7	+ 6

Sixteen Family

7	8	9
+ 9	+ 8	+ 7

Seventeen Family

8	9
+ 9	+ 8

Eighteen Family

9
+ 9

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Handbook

Addition

- **Addition** is the mathematical process of putting numbers together. *p. 3*
- The numbers added together are **addends,** and the answer is the **sum.** *p. 3*
- **To find the sum,** add the addends downward. **To check,** add the addends upward. *p. 3*

Area

- **Area** measures the surface of a simple closed region. Area is found by dividing the region into square units. *p. 285*
- The area of a **rectangle** can be found by using the formula $A = l \times w$. *p. 287*
- The area of a **square** can be found by using the formula $A = s \times s$. *p. 289*

Average

- **To find the average** of several numbers, divide the sum by the number of addends. *p. 53*

Bar Graph

- **A bar graph** is a graph that uses vertical or horizontal bars to make comparisons. *p. 225*

Cancellation

- **Cancellation** is the process used in simplifying fractions before multiplying. *p. 199*
- **In multiplication,** the numerator of one fraction can be canceled by the denominator of any other fraction if they have a common factor. *p. 199*
- Cancellation helps to eliminate the necessity of multiplying large numbers and reducing large numbers in the product. *p. 199*
- **Divisibility rules** can be helpful in cancellation. *p. 199*

Change

- **Change** is the amount spent subtracted from the amount given. *p. 245*
- Change is usually made with the fewest number of coins and bills possible. *p. 239*
- When counting back change, give the smallest denominations first. *p. 239*
- **To count back change,** start with the amount of money the customer spent. Then count back the coins before counting back the bills. Stop counting back when the amount of money the customer gave is reached. *p. 245*
- A wise customer checks the change before leaving the store. *p. 249*
- If too little change is received, politely show the error to the clerk and ask for the remaining money. If too much change is received, return the extra money to the clerk who made the mistake. *p. 249*

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