LESSON 4

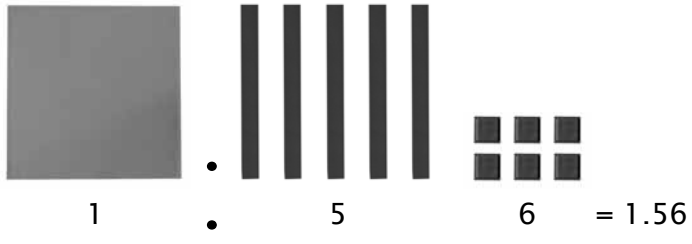
Add Decimal Numbers

In this lesson, we will begin using the algebra-decimal inserts to represent decimals. Turn a red hundred square upside down so the hollow side is showing, and snap the flat green piece (from the algebra/decimal inserts) into the back. Then turn over several blue 10 bars and snap the flat blue pieces (also from the inserts) into their backs. Then take out the little one-half inch red cubes.

The large green square represents one unit. We've increased the size of the unit from the little green cube to this larger size, just as we did when learning fractions. Since the large green square represents one, what do you think the flat blue bars represent? It takes ten of them to make one, so they are each 1/10 or 0.1. The red cubes represent 1/100 or 0.01.

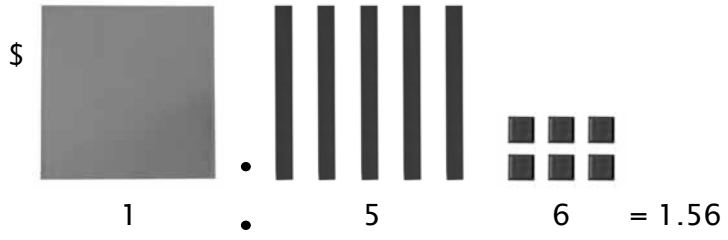
In figure 1, we show how to represent 1.56 or $1\times1 + 5\times\frac{1}{10} + 6\times\frac{1}{100}$ with the decimal inserts.

Figure 1



As we've said before, decimal notation is used for money. If figure 1 represents money with the green unit as one dollar, then 1/10 of a dollar is one dime and is represented by the blue 1/10 bars. As shown with the red cubes, 1/100 of a dollar or 1/10 of a dime is one cent, or one penny.

Figure 2



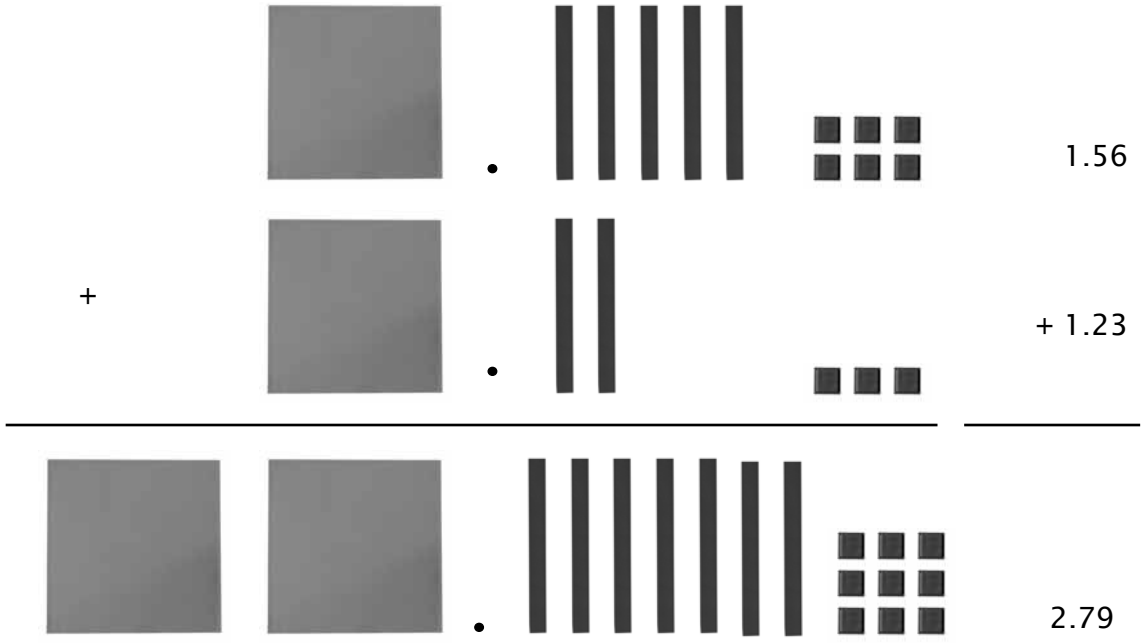
When you add up the change in your pocket, you add dollars to dollars, dimes to dimes, and cents to cents. Thinking of how we count money helps us to understand why the key concept for adding and subtracting decimals is that we add units to units, tenths to tenths, hundredths to hundredths, and thousandths to thousandths. This shouldn't seem strange because we have been adding like place values, regrouping as necessary, since *Beta*.

The easiest way to distinguish the values and make sure you are combining like values is by writing the problem vertically, so the decimal point in one number is directly above (or below) the decimal point in the other number. Lining up these points ensures you that your place values are also lined up. You may only add or subtract two numbers if they have the same value.

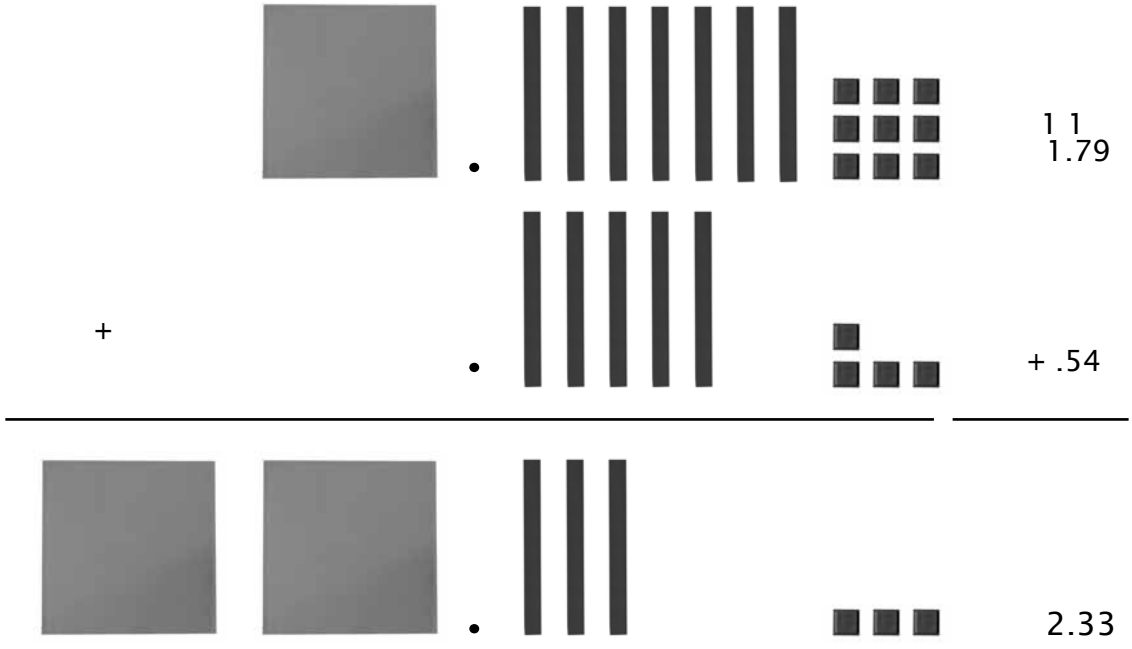
If zero is the only number to the left of the decimal point, you may either keep it or omit it when setting up a problem for computation.

When using the inserts, it is clear that you can only add the green to the green, the blue to the blue, etc. When you don't have enough inserts for larger numbers, always line up the decimal points. The same skills are used for adding decimals and money as for adding any number. Remember that decimals are base 10. You've just learned some new kinds of decimal values.

Example 1
Add 1.56 + 1.23



Example 2
Add 1.79 + 0.54



LESSON PRACTICE

Add the decimal numbers. For better understanding, use the inserts to build some of the problems. (You may not have enough inserts for the larger problems.) The first two are done for you.

1. 1.3 + 2.6 = 3.9

2. 1 / 2.9 + 1.2 = 4.1

3. 1.5 3 + 1.1 2

*4. 2.1 7 + .3 1

5. 1.8 + 1.0

6. 3.2 + .4

7. 1.1 3 + 1.6 8

8. 1.6 7 + .4 2

9. 1.5 + 1.2

10. 2.1 + .8

It is customary to write a zero in the unit place if there are no units. We have not included this zero in problems that are set up for computation. This may be less confusing for students just learning to do decimal problems. Students should understand that the initial zero does not change the value of the number.

11. $\begin{array}{r} 1.1\,6 \\ +\ 1.4\,6 \\ \hline \end{array}$

12. $\begin{array}{r} 3.9\,0 \\ +\ .0\,2 \\ \hline \end{array}$

13. $\begin{array}{r} 2.6 \\ +\ 1.5 \\ \hline \end{array}$

14. $\begin{array}{r} 1.8 \\ +\ 1.3 \\ \hline \end{array}$

15. $\begin{array}{r} 3.0\,0 \\ +\ 1.6\,2 \\ \hline \end{array}$

16. $\begin{array}{r} 4.4\,8 \\ +\ .1\,0 \\ \hline \end{array}$

17. Jon had $4.51 in one pocket and $0.35 in another pocket. How much money did he have in all? (When solving decimal problems, be sure to line up the decimal points.)

18. Emily drove 1.5 miles in the morning and 2.72 miles in the afternoon. How many miles did she drive in all today?

LESSON PRACTICE

Add the decimal numbers. Add thousandths just like regular addition and keep the decimal points lined up. (You probably don't have enough inserts to build these larger decimal problems.)

1. 7.1
   + 6.2

2. 5.9
   + 1.2

3. 2.4 5
   + 5.0 7

4. 4.1 3
   + 1.9 6

5. 7.0
   + 2.8

6. 1.5
   + 9.3

7. 8.8 4
   + 3.0 9

8. .4 3 7
   + .2 5 0

9. 8.8
   + 3.4

10. 6.2
    + .4

11. $\begin{array}{r} 2.70 \\ +\ 9.41 \\ \hline \end{array}$

12. $\begin{array}{r} 5.52 \\ +\ .60 \\ \hline \end{array}$

13. $\begin{array}{r} 3.9 \\ +\ 4.0 \\ \hline \end{array}$

14. $\begin{array}{r} 7.5 \\ +\ .8 \\ \hline \end{array}$

15. $\begin{array}{r} 4.15 \\ +\ 3.00 \\ \hline \end{array}$

16. $\begin{array}{r} .524 \\ +\ .277 \\ \hline \end{array}$

17. Andrew bought a shirt for $12.95 and a pair of jeans for $15.50. How much did Andrew have to pay altogether?

18. Clyde sold 0.625 gallons of lemonade in the morning. The afternoon was hotter, and he sold 2.125 gallons of lemonade. How many gallons of lemonade did Clyde sell that day?

LESSON PRACTICE

Add the decimal numbers.

1. 3.0
   + 9.8

2. 7.1
   + 1.3

3. 1.9 5
   + 8.1 5

4. 3.5 1
   + 2.6 8

5. 5.9
   + .4

6. 4.1
   + 3.0

7. 2.3 4
   + .7 1

8. .4 4 0
   + .3 0 0

9. 6.5
   + 5.0

10. 2.8
    + 5.9

11. $\begin{array}{r} 7.48 \\ +\ 1.93 \\ \hline \end{array}$

12. $\begin{array}{r} .162 \\ +\ 8.000 \\ \hline \end{array}$

13. $\begin{array}{r} 8.7 \\ +\ 8.1 \\ \hline \end{array}$

14. $\begin{array}{r} 6.0 \\ +\ .1 \\ \hline \end{array}$

15. $\begin{array}{r} .731 \\ +\ .402 \\ \hline \end{array}$

16. $\begin{array}{r} 1.125 \\ +\ .112 \\ \hline \end{array}$

17. Jean bought 4.3 bushels of apples and 0.5 bushels of pears. How many bushels of fruit did she buy?

18. A meteorologist had a gauge that could measure rainfall to the thousandth of an inch. On Monday his gauge recorded 2.045 inches, and on Tuesday it recorded exactly 0.5 inches. How much rain fell during the last two days?

SYSTEMATIC REVIEW

Add the decimal numbers.

1. $\begin{array}{r} 1.5 \\ +\ 9.3 \\ \hline \end{array}$

2. $\begin{array}{r} 5.9 \\ +\ 1.6 \\ \hline \end{array}$

3. $\begin{array}{r} 6.3\ 4 \\ +\ 2.4\ 1 \\ \hline \end{array}$

4. $\begin{array}{r} 1.8\ 2 \\ +\ 9.3 \\ \hline \end{array}$

Rewrite each number without using an exponent.

5. $2^3 =$ ____

6. $6^2 =$ ____

7. $10^4 =$ ____

8. $7^2 =$ ____

Write in expanded notation.

9. 176.21 = _____

10. 0.685 = _____

11. 4.5 = _____

Fill in the missing numbers to make equivalent fractions.

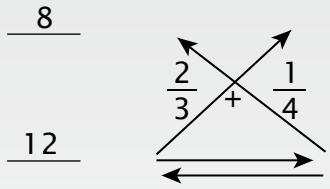
12. $\frac{1}{4} = \frac{\quad}{8} = \frac{3}{\quad} = \frac{\quad}{16}$

13. $\frac{5}{8} = \frac{\quad}{24} = \frac{15}{\quad} = \frac{\quad}{24}$

QUICK REVIEW

Fractions with the same denominator may be added by adding the numerators. The ***rule of four*** is a four-step process for finding a common denominator for two fractions with different denominators. Once the fractions have a common denominator, it is easy to add the fractions by adding the numerators.

Example 1



$$\frac{8}{12} + \frac{3}{12} = \frac{11}{12}$$

Step 1: $3 \times 4 = 12$
Step 2: $3 \times 1 = 3$
Step 3: $4 \times 3 = 12$
Step 4: $4 \times 2 = 8$

Add. Reduce your answer if possible.

14. $\frac{1}{4} + \frac{3}{5} =$ ___

15. $\frac{3}{4} + \frac{1}{6} =$ ___

16. $\frac{1}{3} + \frac{2}{5} =$ ___

17. Peter is 75.25 inches tall, but Steve is 1.75 inches taller. How tall is Steve?

18. Mom bought a bag of 12 apples. She discovered that 1/6 of the apples were spoiled. How many apples were spoiled? How many unspoiled apples does Mom have?

SYSTEMATIC REVIEW

Add the decimal numbers.

1. $\begin{array}{r} 8.6 \\ +\ 2.4 \\ \hline \end{array}$

2. $\begin{array}{r} 3.0 \\ +\ 4.4 \\ \hline \end{array}$

3. $\begin{array}{r} 3.0\ 7 \\ +\ 9.2\ 5 \\ \hline \end{array}$

4. $\begin{array}{r} 5.0\ 0 \\ +\ 3.2\ 4 \\ \hline \end{array}$

Rewrite each number without using an exponent.

5. 3^4 = ____

6. 5^2 = ____

7. 1^7 = ____

8. 10^3 = ____

Write in exponential notation.

9. 43.3 = _____

10. 6.105 = _____

11. 200.34 = _____

Fill in the missing numbers to make equivalent fractions.

12. $\frac{1}{2} = \frac{\quad}{4} = \frac{3}{\quad} = \frac{\quad}{8}$

13. $\frac{9}{10} = \frac{\quad}{\quad} = \frac{\quad}{30} = \frac{36}{40}$

Add. Reduce your answer if possible.

14. $\frac{1}{9} + \frac{1}{2} = \_\_\_$

15. $\frac{2}{5} + \frac{5}{6} = \_\_\_$

16. $\frac{1}{10} + \frac{2}{3} = \_\_\_$

17. Fred spent 0.5 hours plowing the snow from his parking lot and 0.25 hours shoveling the snow from his front walk. How many hours did Fred spend in snow removal?

18. Blake bought 9.5 gallons of gasoline for his car and 11.6 gallons for his wife's car. How many gallons of gasoline did Blake buy altogether?

19. Oscar got 2/3 of his math problems correct. After checking his work he had another 1/5 correct. What part of his math problems is now correct?

20. If Oscar (#19) had 30 math problems in all, how many were correct when he finished checking his work?

SYSTEMATIC REVIEW

Add the decimal numbers.

1. $\begin{array}{r} 5.6 \\ +\ 4.3 \\ \hline \end{array}$

2. $\begin{array}{r} 1.9 \\ +\ 9.2 \\ \hline \end{array}$

3. $\begin{array}{r} 5.1\ 3 \\ +\ 9.5\ 0 \\ \hline \end{array}$

4. $\begin{array}{r} 4.1\ 7 \\ +\ 1.9\ 5 \\ \hline \end{array}$

Rewrite each number without using an exponent.

5. $8^2 =$ ____

6. $10^0 =$ ____

7. $4^3 =$ ____

8. $9^2 =$ ____

Write in decimal notation.

9. $9\times10^3 + 5\times10^2 + 1\times\frac{1}{10^1} =$ _____

10. $1\times10^2 + 5\times10^1 + 8\times10^0 + 4\times\frac{1}{10^3} =$ _____

Fill in the missing numbers to make equivalent fractions.

11. $\frac{1}{3} = \frac{\quad}{\quad} = \frac{3}{\quad} = \frac{\quad}{12}$

12. $\frac{3}{7} = \frac{\quad}{\quad} = \frac{\quad}{21} = \frac{\quad}{\quad}$

Add. Reduce your answer if possible.

13. $\frac{2}{7} + \frac{1}{8} =$ ___

14. $\frac{3}{5} + \frac{2}{9} =$ ___

15. $\frac{3}{4} + \frac{1}{5} =$ ___

16. Bria spent $2.25 on a gallon of milk and $1.69 on a loaf of bread. How much did Bria spend in all?

17. John made $4.00 selling lemonade one day. That evening, he got his allowance of $2.50. He already had $8.35 in his savings bank. How much money does John have in all?

18. Dad said that Jeremy must mow 5/15 of the lawn. How many thirds of the lawn must he mow?

19. At the party, Kelsey ate 3/8 of a pizza, and Riley ate 1/3. Did Kelsey and Riley together eat a whole pizza?

20. Twenty-seven players tried out for the team, but only 5/9 of them were chosen. How many were chosen?

APPLICATION & ENRICHMENT

In an expression like $2(3 + 4)$, one factor is 2 and the other factor is $(3 + 4)$. You can find the value of the expression in two different ways.

Add inside the parentheses first and then multiply the factors. This is what you have learned as the normal order of operations.

$$2(3 + 4) = 2(7) = 14$$

Multiply each of the numbers in the parentheses by 2, and add the results. This works because of the distributive property of multiplication.

$$(2)(3) + (2)(4) = 6 + 8 = 14$$

Find the value of each expression two different ways. Do the answers agree?

1. $3(6 + 1) = 3(7) =$

   $3(6 + 1) = 3(6) + 3(1) =$

2. $4(2 + 5) =$

   $4(2 + 5) =$

3. $2(10 + 6) =$

   $2(10 + 6) =$

4. $6(2 + 3) =$

   $6(2 + 3) =$

5. $7(8 + 4) =$

   $7(8 + 4) =$

The distributive property of multiplication still applies when letters are used for unknown values. The expression 3(2 + X) has two factors. They are 3 and (2 + X). Since we don't know the value of X, we cannot add the numbers inside the parentheses. However, we can multiply each part of (2 + X) by 3 to write the expression another way.

3(2 + X) = (3)(2) + (3)(X) = 6 + 3X

The value of X is unknown, so the terms 6 and 3X can't be added.

Rewrite each expression using the method shown above.

6. 4(2 + B) =

7. 8(A + 4) =

Here is an example with two unknowns: 4(A + B) = (4)(A) + (4)(B) = 4A + 4B

8. 2(X + Z) =

9. 7(A + 2Y) =

When two or more terms have a common factor we can apply the distributive property in reverse to factor out the greatest common factor. Look for the greatest common factor of each term as you did in Application & Enrichment 3G. In the expression 6 + 12Y, the GCF is 6. We can rewrite this expression as 6(1) + 6(2Y) or as 6(1 + 2Y).

Use the GCF to rewrite each expression using the distributive property in reverse.

10. 6 + 10B =

11. 15 + 35X =

12. 9 + 72Y =

LESSON TEST

Add the decimal numbers.

1. $\begin{array}{r} 6.7 \\ +\,5.4 \\ \hline \end{array}$

2. $\begin{array}{r} 2.0 \\ +\ .2 \\ \hline \end{array}$

3. $\begin{array}{r} 6.2\,4 \\ +\,8.4\,0 \\ \hline \end{array}$

4. $\begin{array}{r} 5.2\,8 \\ +\,2.0\,5 \\ \hline \end{array}$

Rewrite each number without an exponent.

5. $1^3 =$ ____

6. $10^2 =$ ____

7. $6^3 =$ ____

8. $7^2 =$ ____

Write in decimal notation.

9. $8\times10^3 + 4\times10^2 + 2\times\frac{1}{10^1} =$ _____

10. $2\times10^2 + 6\times10^1 + 9\times10^0 + 5\times\frac{1}{10^3} =$ _____

Fill in the missing numbers to make equivalent fractions.

11. $\frac{4}{5} = \frac{\quad}{\quad} = \frac{12}{\quad} = \frac{\quad}{20}$

12. $\frac{5}{9} = \frac{\quad}{\quad} = \frac{\quad}{27} = \frac{\quad}{\quad}$

Add. Reduce your answer if possible.

13. $\frac{1}{6} + \frac{2}{9} =$ ____

14. $\frac{1}{5} + \frac{7}{10} =$ ____

15. $\frac{1}{3} + \frac{3}{8} =$ ____

16. Fritha has $4.75 and Rachel has $6.29. Do they have enough money to buy a game that costs $11.00?

17. Gary plans to buy a diamond necklace for his wife. The jeweler showed him the diamonds he wants to use for the necklace. They weighed 1.2 carats, 0.75 carats, and 1.15 carats. What was the total weight of the three diamonds?

18. Matthew must use 4/10 of his income for rent. How many fifths of Matthew's income is that?

19. Tess did 5/8 of the chores and Dustin did 1/6 of them. What part of the chores have been done?

20. It rained for 3/5 of the days in April this year. Since there are 30 days in April, how many days did it rain?

3. 451.221
4. 10.607
5. dollar; dimes; cents;
   $\$1.00 + \$0.00 + \$0.09 = \$1.09$
6. 6; 7; 5; $\$6.00 + \$0.70 + \$0.05 = \$6.75$
7. $3^2 = 9$
8. $4^3 = 64$
9. $2^2 = 4$
10. $10^3 = 1{,}000$
11. $\frac{4}{5} = \frac{8}{10} = \frac{12}{15} = \frac{16}{20}$
12. $\frac{3}{7} = \frac{6}{14} = \frac{9}{21} = \frac{12}{28}$
13. $\frac{11}{22} \div \frac{11}{11} = \frac{1}{2}$
14. $\frac{5}{25} \div \frac{5}{5} = \frac{1}{5}$
15. $\frac{4}{16} \div \frac{4}{4} = \frac{1}{4}$
16. $\frac{8}{32} \div \frac{8}{8} = \frac{1}{4}$
17. $\$1.00 + \$0.40 + \$0.07 = \$1.47$
18. $100¢ \div 5 = 20¢$;
    $20¢ \times 3 = 60¢$
19. $\frac{2}{4} = \frac{1}{2}$ of a melon
20. $10^2 = 100$ blocks

Systematic Review 3F

1. $1 \times 10^0 + 1 \times \frac{1}{10^3}$
2. $1 \times 10^3 + 3 \times 10^2 + 5 \times 10^1 +$
   $8 \times 10^0 + 9 \times \frac{1}{10^1} + 1 \times \frac{1}{10^2}$
3. 6,528.05
4. 2,000.986
5. dollars; dimes; cents;
   $\$9.00 + \$0.80 + \$0.07 = \$9.87$
6. dollars; dimes; cents;
   $\$2.00 + \$0.00 + \$0.08 = \$2.08$
7. $3^4 = 81$
8. $1^3 = 1$
9. $10^0 = 1$
10. $5^2 = 25$
11. $\frac{9}{10} = \frac{18}{20} = \frac{27}{30} = \frac{36}{40}$
12. $\frac{1}{6} = \frac{2}{12} = \frac{3}{18} = \frac{4}{24}$
13. $\frac{5}{30} \div \frac{5}{5} = \frac{1}{6}$
14. $\frac{14}{35} \div \frac{7}{7} = \frac{2}{5}$
15. $\frac{20}{40} \div \frac{20}{20} = \frac{1}{2}$
16. $\frac{18}{27} \div \frac{9}{9} = \frac{2}{3}$
17. $\$6.00 + \$0.09 = \$6.09$
18. $100¢ \div 100 = 1¢$;
    $1¢ \times 7 = 7¢$
19. $\frac{9}{12} = \frac{3}{4}$ of the dishes
20. 20 questions $\div 5 = 4$;
    $4 \times 4 = 16$ questions

Lesson Practice 4A

1. done
2. done
3. $\begin{array}{r} 1.53 \\ +1.12 \\ \hline 2.65 \end{array}$
4. $\begin{array}{r} 2.17 \\ +\ .31 \\ \hline 2.48 \end{array}$
5. $\begin{array}{r} 1.8 \\ +1.0 \\ \hline 2.8 \end{array}$
6. $\begin{array}{r} 3.2 \\ +\ .4 \\ \hline 3.6 \end{array}$
7. $\begin{array}{r} {\scriptstyle 1} \\ 1.13 \\ +1.68 \\ \hline 2.81 \end{array}$
8. $\begin{array}{r} {\scriptstyle 1} \\ 1.67 \\ +\ .42 \\ \hline 2.09 \end{array}$