

# Epsilon

## Lesson 9 Multiplying Fractions

- (1) Epsilon Instruction Manual, Lesson 9
- (2) Epsilon Student Text, Lesson 9
- (3) Epsilon Test Booklet, Test 9
- (4) Epsilon Instruction Manual, Lesson 9 Solutions

We trust that these Epsilon Sample Pages will give you an idea of Math-U-See's unique method of instruction.

Now that students have learned basic operations with whole numbers, Epsilon covers these same operations with fractions. Fractions are presented in an intuitive way with visual explanations of equivalent fractions, common denominators, and fractions and numbers larger than 1. Fractions and operations are illustrated using our proprietary Fraction Overlay manipulatives.

If you believe that Epsilon is the level for your student to begin, please confirm this by completing our free online placement tests.

To Your Success!!



## LESSON 9

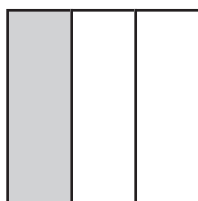
# Multiplying Fractions

## or a Fraction of a Fraction; Mental Maths

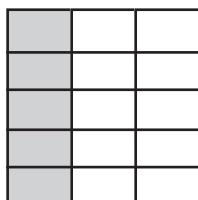
We've worked on a fraction of one and a fraction of a number; now we'll tackle a fraction of a fraction. This kind of problem can be the hardest to understand or think through, but it is the easiest to do using a formula. Find  $\frac{2}{5}$  of  $\frac{1}{3}$ . Notice that we don't say, "two-fifths *times* one-third." Even though it is the same as multiplying two fractions, I want to relate it to a fraction of a number and a fraction of one. To stress this relationship, we read it "two-fifths **of** one-third". This is also the language used in most word problems. Be sure to read the note about word problems on lesson practice 9A in the student text.

### Example 1

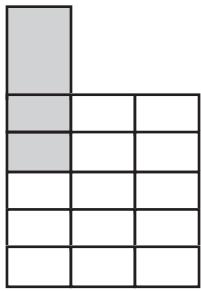
Find  $\frac{2}{5}$  of  $\frac{1}{3}$  (two-fifths of one-third).



**Step 1** Start with  $\frac{1}{3}$ .



**Step 2** Divide into 5 equal parts.



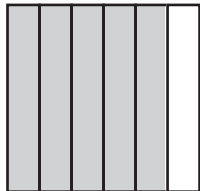
**Step 3** Count 2 of those parts.

Pull up the pink insert to do this.

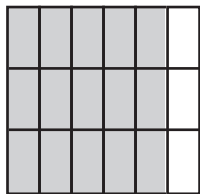
So  $\frac{2}{5}$  of  $\frac{1}{3}$  is  $\frac{2}{15}$ .

**Example 2**

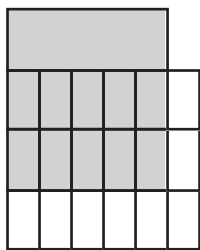
Find  $\frac{2}{3}$  of  $\frac{5}{6}$  (two-thirds of five-sixths).



**Step 1** Start with  $\frac{5}{6}$ .



**Step 2** Divide into 3 equal parts.



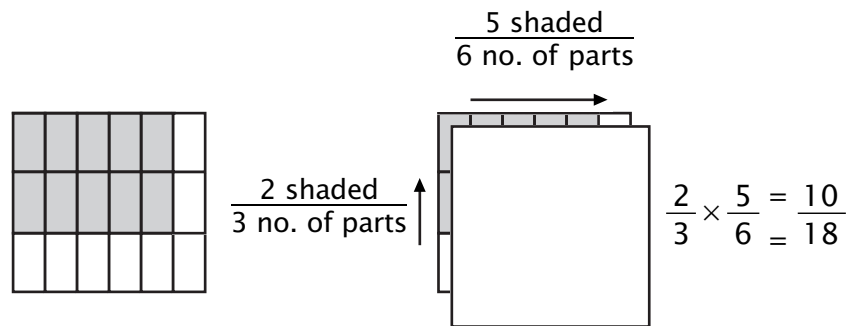
**Step 3** Count 2 of those parts.

Pull up the violet insert to do this.

So  $\frac{2}{3}$  of  $\frac{5}{6}$  is  $\frac{10}{18}$ .

Another way to understand the formula for a fraction of a fraction (multiplying fractions) is shown in figure 1, which reveals the finished answer to example 2. To make the “factors” clearer I placed a white piece over the answer so you can see just the two factors of the two rectangles. I hope this helps you “see” numerator times numerator, divided by denominator times denominator.

**Figure 1**



The whole square is an illustration of  $\frac{2}{3} \times \frac{5}{6}$ , which is a multiplication problem. In this problem we can see the two smaller problems. The numerator problem has the factors  $2 \times 5$ . The denominator problem has the factors  $3 \times 6$ . This exercise reveals the formula for multiplying two fractions.

$$\frac{2}{3} \times \frac{5}{6} = \frac{2 \times 5}{3 \times 6} = \frac{10}{18}$$

Numerator times numerator (shaded rectangle)  
Denominator times denominator (total no. of parts)

## MENTAL MATHS

Here are some more mental maths problems for you to read aloud to your student. Try a few at a time, going slowly at first.

1. Four plus five, times two, divided by three, equals? (6)
2. Thirty-six divided by four, minus two, times five, equals? (35)
3. Sixty-six divided by six, plus four, divided by three, equals? (5)
4. Forty-eight divided by eight, times six, plus two, equals? (38)
5. Six plus seven, minus four, times nine, equals? (81)
6. Nineteen minus three, divided by four, times seven, equals? (28)
7. Nine times five, plus three, divided by six, equals? (8)
8. Twenty-one divided by seven, plus one, times five, equals? (20)
9. Three times four, divided by two, times nine, equals? (54)
10. Seven times six, plus two, divided by 11, equals? (4)

## LESSON PRACTICE

Find a fraction of a fraction. These can all be built with the overlays. The first one is done for you.

1.  $\frac{2}{4}$  of  $\frac{3}{6} = \frac{2 \times 3}{4 \times 6} = \frac{6}{24}$

2.  $\frac{3}{5}$  of  $\frac{3}{4} = \underline{\hspace{2cm}}$

3.  $\frac{1}{3}$  of  $\frac{1}{2} = \underline{\hspace{2cm}}$

4.  $\frac{4}{6}$  of  $\frac{2}{5} = \underline{\hspace{2cm}}$

5.  $\frac{2}{3}$  of  $\frac{1}{4} = \underline{\hspace{2cm}}$

6.  $\frac{1}{5}$  of  $\frac{5}{6} = \underline{\hspace{2cm}}$

7.  $\frac{4}{5}$  of  $\frac{2}{6} = \underline{\hspace{2cm}}$

8.  $\frac{1}{6}$  of  $\frac{1}{3} = \underline{\hspace{2cm}}$

9.  $\frac{1}{2}$  of  $\frac{2}{6} = \underline{\hspace{2cm}}$

Multiply the fractions (find a fraction of a fraction). These can all be built with the overlays.

10.  $\frac{3}{5} \times \frac{2}{5} = \text{_____}$

11.  $\frac{3}{6} \times \frac{2}{3} = \text{_____}$

12.  $\frac{2}{4} \times \frac{1}{5} = \text{_____}$

13.  $\frac{3}{4} \times \frac{4}{6} = \text{_____}$

14.  $\frac{2}{5} \times \frac{1}{2} = \text{_____}$

15.  $\frac{4}{6} \times \frac{1}{3} = \text{_____}$

Always read fraction word problems carefully and think about what is happening. Multiplication problems involving fractions usually use the word “of,” but you should not assume that the word “of” somewhere in the problem automatically indicates multiplication. Read for meaning; don’t just look for key words. All of the examples on lesson practice A, B, and C are multiplication of fractions.

16. A recipe calls for  $\frac{1}{3}$  of a cup of butter. If Matthew is making  $\frac{1}{4}$  of the recipe, how much butter should he use?
17. One-half of the people at the picnic went home sick, but only one-fifth of them were seriously ill. What part of the whole group was seriously ill?
18. Mum left  $\frac{1}{3}$  of a pie for Chuck to eat, but since he was not very hungry, he ate only  $\frac{1}{5}$  of what was there. What part of a whole pie did Chuck eat?

## LESSON PRACTICE

Find a fraction of a fraction. These can all be built with the overlays.

1.  $\frac{2}{6}$  of  $\frac{3}{5}$  = \_\_\_\_\_

2.  $\frac{2}{3}$  of  $\frac{1}{2}$  = \_\_\_\_\_

3.  $\frac{3}{8}$  of  $\frac{2}{4}$  = \_\_\_\_\_

4.  $\frac{1}{4}$  of  $\frac{1}{5}$  = \_\_\_\_\_

5.  $\frac{1}{6}$  of  $\frac{2}{3}$  = \_\_\_\_\_

6.  $\frac{1}{3}$  of  $\frac{4}{5}$  = \_\_\_\_\_

7.  $\frac{4}{5}$  of  $\frac{3}{6}$  = \_\_\_\_\_

8.  $\frac{1}{2}$  of  $\frac{5}{6}$  = \_\_\_\_\_

9.  $\frac{3}{4}$  of  $\frac{3}{4}$  = \_\_\_\_\_



Multiply the fractions (find a fraction of a fraction). Not all of these can be built with the overlays.

10.  $\frac{2}{5} \times \frac{4}{6} = \text{_____}$

11.  $\frac{1}{7} \times \frac{1}{2} = \text{_____}$

12.  $\frac{3}{5} \times \frac{5}{6} = \text{_____}$

13.  $\frac{3}{10} \times \frac{1}{4} = \text{_____}$

14.  $\frac{1}{4} \times \frac{1}{2} = \text{_____}$

15.  $\frac{7}{8} \times \frac{1}{9} = \text{_____}$

16. Three-fourths of the class volunteered for the special project, but only one-fourth of the volunteers were finished with their work and could do the project. What part of the whole class could participate?
17. Joan picked  $\frac{2}{3}$  of a box of tomatoes and gave  $\frac{3}{5}$  of what she had picked to her neighbour. What part of a whole box did her neighbour receive?
18. Ryan's team lost  $\frac{1}{5}$  of the games they played. In  $\frac{1}{5}$  of the games they lost, they did not score at all. In what part of the total games they played did they fail to score?

## LESSON PRACTICE

Find a fraction of a fraction.

1.  $\frac{3}{6}$  of  $\frac{2}{5}$  = \_\_\_\_\_

2.  $\frac{2}{9}$  of  $\frac{2}{3}$  = \_\_\_\_\_

3.  $\frac{2}{6}$  of  $\frac{1}{3}$  = \_\_\_\_\_

4.  $\frac{3}{4}$  of  $\frac{4}{5}$  = \_\_\_\_\_

5.  $\frac{1}{7}$  of  $\frac{3}{4}$  = \_\_\_\_\_

6.  $\frac{1}{6}$  of  $\frac{1}{6}$  = \_\_\_\_\_

7.  $\frac{4}{8}$  of  $\frac{1}{3}$  = \_\_\_\_\_

8.  $\frac{3}{5}$  of  $\frac{3}{4}$  = \_\_\_\_\_

9.  $\frac{4}{6}$  of  $\frac{2}{4}$  = \_\_\_\_\_

Multiply the fractions.

10.  $\frac{1}{6} \times \frac{2}{5} = \text{_____}$

11.  $\frac{5}{9} \times \frac{1}{4} = \text{_____}$

12.  $\frac{1}{10} \times \frac{1}{10} = \text{_____}$

13.  $\frac{2}{3} \times \frac{3}{6} = \text{_____}$

14.  $\frac{3}{5} \times \frac{1}{2} = \text{_____}$

15.  $\frac{1}{8} \times \frac{3}{5} = \text{_____}$

16. It is  $\frac{4}{5}$  of a kilometre around the track. If Trevor ran  $\frac{2}{4}$  of the way around, what part of a kilometre did he run?
17. Stephanie is making cookies. The recipe calls for  $\frac{2}{3}$  of a cup of milk, but Stephanie is making only  $\frac{1}{3}$  of the recipe. How much milk should she use?
18. Seven-eighths of a pie was left over from dinner. If Robin ate one-seventh of what was there, what part of a whole pie did she eat?

## SYSTEMATIC REVIEW

Multiply (fraction of a fraction).

1.  $\frac{2}{5}$  of  $\frac{1}{5} = \underline{\hspace{2cm}}$

2.  $\frac{5}{6} \times \frac{1}{4} = \underline{\hspace{2cm}}$

3.  $\frac{5}{9} \times \frac{1}{2} = \underline{\hspace{2cm}}$

Add or subtract.

4.  $\frac{1}{7} + \frac{1}{3} = \underline{\hspace{2cm}}$

5.  $\frac{2}{3} - \frac{1}{7} = \underline{\hspace{2cm}}$

6.  $\frac{1}{2} + \frac{2}{5} + \frac{7}{10} = \underline{\hspace{2cm}}$

Use the rule of four to make denominators the same, and then compare the fractions.

7.  $\frac{4}{6} \bigcirc \frac{1}{7}$

8.  $\frac{2}{3} \bigcirc \frac{5}{8}$

9.  $\frac{1}{9} \bigcirc \frac{2}{11}$

Fill in the missing numbers in the numerators or denominators to make equivalent fractions.

10.  $\frac{2}{7} = \frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{28}$

11.  $\frac{\quad}{\quad} = \frac{2}{18} = \frac{\quad}{\quad} = \frac{4}{\quad}$



**QUICK REVIEW**

Here is a chance to review multiplying a two-digit number by a three-digit number. The first one is done for you.

Estimate, and then multiply to find the exact answer.

12. 
$$\begin{array}{r} 623 \\ \times 45 \\ \hline 3105 \\ 2482 \\ \hline 28035 \end{array}$$

13. 
$$\begin{array}{r} 600 \\ \times 50 \\ \hline 30000 \end{array}$$

This is 5 tens x 6 hundreds.

14. 
$$\begin{array}{r} 902 \\ \times 11 \\ \hline \end{array}$$

- 15. Mum is making  $\frac{1}{3}$  of a recipe that calls for  $\frac{2}{3}$  of a cup of flour. How much flour should she use?
- 16. If there are 365 days in one year, how many days are there in 25 years? (Don't worry about leap years.)
- 17. Nancy strolled down a path that was 75 metres long. How many centimetres long was the path?
- 18. Ivan spotted 36 birds Saturday morning at Mt. Tibrogargan. Three-fourths of them were eagles. How many eagles did he see?

## SYSTEMATIC REVIEW

Multiply (fraction of a fraction).

1.  $\frac{1}{2}$  of  $\frac{2}{3} = \underline{\hspace{2cm}}$

2.  $\frac{7}{8} \times \frac{2}{5} = \underline{\hspace{2cm}}$

3.  $\frac{1}{3} \times \frac{3}{5} = \underline{\hspace{2cm}}$

Add or subtract.

4.  $\frac{3}{4} + \frac{1}{9} = \underline{\hspace{2cm}}$

5.  $\frac{2}{3} - \frac{2}{5} = \underline{\hspace{2cm}}$

6.  $\frac{3}{8} + \frac{5}{8} + \frac{1}{4} = \underline{\hspace{2cm}}$

Use the rule of four to make denominators the same, and then compare the fractions.

7.  $\frac{3}{9} \bigcirc \frac{1}{3}$

8.  $\frac{2}{5} \bigcirc \frac{3}{8}$

9.  $\frac{5}{7} \bigcirc \frac{7}{10}$

Estimate, and then multiply to find the exact answer.

$$10. \begin{array}{r} 125 \\ \times 51 \\ \hline \end{array}$$

$$11. \begin{array}{r} 254 \\ \times 35 \\ \hline \end{array}$$

$$12. \begin{array}{r} 563 \\ \times 26 \\ \hline \end{array}$$

Divide.

$$13. 6 \overline{)107}$$

$$14. 8 \overline{)395}$$

$$15. 2 \overline{)459}$$

16. Simon has done  $\frac{4}{5}$  of his chores. Jan helped him with  $\frac{1}{2}$  of what is done. What part of the total amount of chores did Jan help Simon do?
17. Sally finished  $\frac{1}{6}$  of the job, Sarah did  $\frac{1}{5}$  of it, and Sue accomplished  $\frac{1}{4}$  of the job. What part of the job has been finished?
18. Donna's car goes forward 127 cm every time the wheels go around one time. How many millimetres is that?
19. What is the perimeter of a triangle whose sides measure 12 metres, 17 metres, and 28 metres?
20. Christel counted out 235 jelly beans. She gave  $\frac{3}{5}$  of them to her mum. How many jelly beans did she give to her mum?

## SYSTEMATIC REVIEW

Multiply (fraction of a fraction).

1.  $\frac{2}{4}$  of  $\frac{2}{5} = \underline{\hspace{2cm}}$

2.  $\frac{1}{3} \times \frac{2}{6} = \underline{\hspace{2cm}}$

3.  $\frac{1}{2} \times \frac{4}{9} = \underline{\hspace{2cm}}$

Add or subtract.

4.  $\frac{2}{3} + \frac{1}{5} = \underline{\hspace{2cm}}$

5.  $\frac{2}{5} - \frac{3}{8} = \underline{\hspace{2cm}}$

6.  $\frac{1}{4} + \frac{3}{5} + \frac{2}{3} = \underline{\hspace{2cm}}$

Use the rule of four to make denominators the same, and then compare the fractions.

7.  $\frac{5}{6} \bigcirc \frac{4}{8}$

8.  $\frac{3}{5} \bigcirc \frac{4}{9}$

9.  $\frac{3}{4} \bigcirc \frac{6}{8}$



Estimate, and then multiply to find the exact answer.

$$10. \begin{array}{r} 558 \\ \times 62 \\ \hline \end{array}$$

$$11. \begin{array}{r} 407 \\ \times 83 \\ \hline \end{array}$$

$$12. \begin{array}{r} 349 \\ \times 12 \\ \hline \end{array}$$

Divide.

$$13. 7 \overline{)128}$$

$$14. 3 \overline{)471}$$

$$15. 5 \overline{)298}$$

16. One booklet is  $\frac{1}{2}$  of a centimetre thick. If three booklets are stacked in a pile, how high is the pile?
17. Caitlyn walked  $\frac{4}{5}$  of a kilometre, while Justin walked  $\frac{1}{3}$  of a kilometre. How much farther did Caitlyn walk?
18. One-third of the people in the room have birthdays in the summer. One-half of the summer birthdays are in July. If there are 12 people in the room, how many were born in July?
19. What is the perimeter of a triangle whose sides measure 13 centimetres, 19 centimetres, and 26 centimetres?
20. Duncan woke up early on  $\frac{1}{2}$  of the days last month. If the month had 30 days, how many days did Duncan wake up early?

Multiply (fraction of a fraction).

1.  $\frac{1}{4}$  of  $\frac{1}{3} = \text{---}$

2.  $\frac{3}{4} \times \frac{2}{5} = \text{---}$

3.  $\frac{2}{7} \times \frac{1}{4} = \text{---}$

4.  $\frac{2}{5}$  of  $\frac{3}{7} = \text{---}$

5.  $\frac{3}{5} \times \frac{1}{6} = \text{---}$

6.  $\frac{2}{4} \times \frac{1}{3} = \text{---}$

Add or subtract.

7.  $\frac{3}{11} + \frac{1}{4} = \text{---}$

8.  $\frac{4}{5} - \frac{1}{6} = \text{---}$

9.  $\frac{1}{7} + \frac{2}{3} + \frac{1}{2} = \text{---}$

Use the rule of four to make denominators the same, and then compare the fractions.

$$10. \quad \frac{2}{3} \bigcirc \frac{5}{8}$$

$$11. \quad \frac{3}{4} \bigcirc \frac{9}{12}$$

$$12. \quad \frac{5}{6} \bigcirc \frac{7}{9}$$

Estimate, then multiply to find the exact answer.

$$13. \quad \begin{array}{r} 612 \rightarrow \\ \times 54 \\ \hline \end{array}$$

$$14. \quad \begin{array}{r} 124 \rightarrow \\ \times 36 \\ \hline \end{array}$$

$$15. \quad \begin{array}{r} 957 \rightarrow \\ \times 13 \\ \hline \end{array}$$

16. One-third of the customers at the ice cream shop bought vanilla and two-fifths of them bought chocolate. What part of the customers bought vanilla or chocolate?
17. What is the perimeter of a triangle whose sides measure 10 metres, 12 metres, and 12 metres?
18. Three-eighths of the guests at the picnic ate hamburgers. One-half of those people had mustard on their hamburgers. What part of the people at the picnic had hamburgers with mustard?
19. If there were 48 people at the picnic (no. 18), how many had hamburgers? How many had hamburgers with mustard?
20. Each of the 48 people at the picnic contributed \$15 for food and other costs. How much money was collected?

8.  $\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}$
9.  $32 \times 55 = 1760$
10.  $76 \times 41 = 3116$
11.  $29 \times 17 = 493$
12.  $361 \div 7 = 51\frac{4}{7}$
13.  $734 \div 9 = 81\frac{5}{9}$
14.  $108 \div 5 = 21\frac{3}{5}$
15.  $\frac{2}{10} + \frac{1}{10} + \frac{5}{10} = \frac{8}{10}$   
 $\frac{10}{10} - \frac{8}{10} = \frac{2}{10}$  of his allowance
16. 90
17. 100
18.  $5 + 3 + 5 + 3 = 16$  km
19.  $28 \div 7 = 4$ ;  $4 \times 1 = 4$  days
20.  $25 \div 4 = 6\frac{1}{4}$  chocolates

### Lesson Practice 9A

1. done
2.  $\frac{3 \times 3}{5 \times 4} = \frac{9}{20}$
3.  $\frac{1 \times 1}{3 \times 2} = \frac{1}{6}$
4.  $\frac{4 \times 2}{6 \times 5} = \frac{8}{30}$
5.  $\frac{2 \times 1}{3 \times 4} = \frac{2}{12}$
6.  $\frac{1 \times 5}{5 \times 6} = \frac{5}{30}$
7.  $\frac{4 \times 2}{5 \times 6} = \frac{8}{30}$
8.  $\frac{1 \times 1}{6 \times 3} = \frac{1}{18}$
9.  $\frac{1 \times 2}{2 \times 6} = \frac{2}{12}$
10.  $\frac{3}{5} \times \frac{2}{5} = \frac{6}{25}$
11.  $\frac{3}{6} \times \frac{2}{3} = \frac{6}{18}$
12.  $\frac{2}{4} \times \frac{1}{5} = \frac{2}{20}$
13.  $\frac{3}{4} \times \frac{4}{6} = \frac{12}{24}$
14.  $\frac{2}{5} \times \frac{1}{2} = \frac{2}{10}$
15.  $\frac{4}{6} \times \frac{1}{3} = \frac{4}{18}$

16.  $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$  of a cup
17.  $\frac{1}{2} \times \frac{1}{5} = \frac{1}{10}$  of the group
18.  $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$  of a pie

### Lesson Practice 9B

1.  $\frac{2 \times 3}{6 \times 5} = \frac{6}{30}$
2.  $\frac{2 \times 1}{3 \times 2} = \frac{2}{6}$
3.  $\frac{3 \times 2}{8 \times 4} = \frac{6}{32}$
4.  $\frac{1 \times 1}{4 \times 5} = \frac{1}{20}$
5.  $\frac{1 \times 2}{6 \times 3} = \frac{2}{18}$
6.  $\frac{1 \times 4}{3 \times 5} = \frac{4}{15}$
7.  $\frac{4 \times 3}{5 \times 6} = \frac{12}{30}$
8.  $\frac{1 \times 5}{2 \times 6} = \frac{5}{12}$
9.  $\frac{3 \times 3}{4 \times 4} = \frac{9}{16}$
10.  $\frac{2}{5} \times \frac{4}{6} = \frac{8}{30}$
11.  $\frac{1}{7} \times \frac{1}{2} = \frac{1}{14}$
12.  $\frac{3}{5} \times \frac{5}{6} = \frac{15}{30}$
13.  $\frac{3}{10} \times \frac{1}{4} = \frac{3}{40}$
14.  $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$
15.  $\frac{7}{8} \times \frac{1}{9} = \frac{7}{72}$
16.  $\frac{3}{4} \times \frac{1}{4} = \frac{3}{16}$  of the class
17.  $\frac{2}{3} \times \frac{3}{5} = \frac{6}{15}$  of a box
18.  $\frac{1}{5} \times \frac{1}{5} = \frac{1}{25}$  of the games

### Lesson Practice 9C

1.  $\frac{3 \times 2}{6 \times 5} = \frac{6}{30}$
2.  $\frac{2 \times 2}{9 \times 3} = \frac{4}{27}$

3.  $\frac{2 \times 1}{6 \times 3} = \frac{2}{18}$
4.  $\frac{3 \times 4}{4 \times 5} = \frac{12}{20}$
5.  $\frac{1 \times 3}{7 \times 4} = \frac{3}{28}$
6.  $\frac{1 \times 1}{6 \times 6} = \frac{1}{36}$
7.  $\frac{4 \times 1}{8 \times 3} = \frac{4}{24}$
8.  $\frac{3 \times 3}{5 \times 4} = \frac{9}{20}$
9.  $\frac{4 \times 2}{6 \times 4} = \frac{8}{24}$
10.  $\frac{1 \times 2}{6 \times 5} = \frac{2}{30}$
11.  $\frac{5}{9} \times \frac{1}{4} = \frac{5}{36}$
12.  $\frac{1 \times 1}{10 \times 10} = \frac{1}{100}$
13.  $\frac{2 \times 3}{3 \times 6} = \frac{6}{18}$
14.  $\frac{3 \times 1}{5 \times 2} = \frac{3}{10}$
15.  $\frac{1 \times 3}{8 \times 5} = \frac{3}{40}$
16.  $\frac{4}{5} \times \frac{2}{4} = \frac{8}{20}$  km
17.  $\frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$  of a cup
18.  $\frac{7}{8} \times \frac{1}{7} = \frac{7}{56}$  of a pie

### Systematic Review 9D

1.  $\frac{2}{5} \times \frac{1}{5} = \frac{2}{25}$
2.  $\frac{5}{6} \times \frac{1}{4} = \frac{5}{24}$
3.  $\frac{5}{9} \times \frac{1}{2} = \frac{5}{18}$
4.  $\frac{3}{21} + \frac{7}{21} = \frac{10}{21}$
5.  $\frac{14}{21} - \frac{3}{21} = \frac{11}{21}$
6.  $\frac{5}{10} + \frac{4}{10} + \frac{7}{10} = \frac{16}{10}$  or  $1\frac{6}{10}$
7.  $\frac{28}{42} > \frac{6}{42}$
8.  $\frac{16}{24} > \frac{15}{24}$
9.  $\frac{11}{99} < \frac{18}{99}$
10.  $\frac{2}{7} = \frac{4}{14} = \frac{6}{21} = \frac{8}{28}$

11.  $\frac{1}{9} = \frac{2}{18} = \frac{3}{27} = \frac{4}{36}$
12. done
13.  $(200) \times (60) = (12\ 000)$   
 $179 \times 57 = 10\ 203$
14.  $(900) \times (10) = (9000)$   
 $902 \times 11 = 9922$
15.  $\frac{1}{3} \times \frac{2}{3} = \frac{2}{9}$  of a cup
16.  $365 \times 25 = 9125$  days
17.  $75 \times 100 = 7500$  cm
18.  $36 \div 4 = 9$   
 $9 \times 3 = 27$  eagles

### Systematic Review 9E

1.  $\frac{1}{2} \times \frac{2}{3} = \frac{2}{6}$
2.  $\frac{7}{8} \times \frac{2}{5} = \frac{14}{40}$
3.  $\frac{1}{3} \times \frac{3}{5} = \frac{3}{15}$
4.  $\frac{27}{36} + \frac{4}{36} = \frac{31}{36}$
5.  $\frac{10}{15} - \frac{6}{15} = \frac{4}{15}$
6.  $\frac{3}{8} + \frac{5}{8} = \frac{8}{8} = 1$   
 $1 + \frac{2}{8} = 1\frac{2}{8}$  or  $1\frac{1}{4}$
7.  $\frac{9}{27} = \frac{9}{27}$
8.  $\frac{16}{40} > \frac{15}{40}$
9.  $\frac{50}{70} > \frac{49}{70}$
10.  $(100) \times (50) = (5000)$   
 $125 \times 51 = 6375$
11.  $(300) \times (40) = (12\ 000)$   
 $254 \times 35 = 8890$
12.  $(600) \times (30) = (18\ 000)$   
 $563 \times 26 = 14\ 638$
13.  $107 \div 6 = 17\frac{5}{6}$
14.  $395 \div 8 = 49\frac{3}{8}$
15.  $459 \div 2 = 229\frac{1}{2}$
16.  $\frac{1}{2} \times \frac{4}{5} = \frac{4}{10}$  of the chores

17.  $\frac{5}{30} + \frac{6}{30} = \frac{11}{30}$   
 $\frac{11}{30} + \frac{1}{4} = \frac{44}{120} + \frac{30}{120} = \frac{74}{120}$   
of the job
18.  $10 \times 127 = 1270$  mm
19.  $12 + 17 + 28 = 57$  m
20.  $235 \div 5 = 47$ ;  $47 \times 3 = 141$   
jelly beans

### Systematic Review 9F

- $\frac{2}{4} \times \frac{2}{5} = \frac{4}{20}$
- $\frac{1}{3} \times \frac{2}{6} = \frac{2}{18}$
- $\frac{1}{2} \times \frac{4}{9} = \frac{4}{18}$
- $\frac{10}{15} + \frac{3}{15} = \frac{13}{15}$
- $\frac{16}{40} - \frac{15}{40} = \frac{1}{40}$
- $\frac{5}{20} + \frac{12}{20} = \frac{17}{20}$   
 $\frac{17}{20} + \frac{2}{3} = \frac{51}{60} + \frac{40}{60} = \frac{91}{60}$  or  $1\frac{31}{60}$
- $\frac{40}{48} > \frac{24}{48}$
- $\frac{27}{45} > \frac{20}{45}$
- $\frac{24}{32} = \frac{24}{32}$
- $(600) \times (60) = (36\ 000)$   
 $558 \times 62 = 34\ 596$
- $(400) \times (80) = (32\ 000)$   
 $407 \times 83 = 33\ 781$
- $(300) \times (10) = (3000)$   
 $349 \times 12 = 4188$
- $128 \div 7 = 18\frac{2}{7}$
- $471 \div 3 = 157$
- $298 \div 5 = 59\frac{3}{5}$
- $\frac{3}{1} \times \frac{1}{2} = \frac{3}{2} = 1\frac{1}{2}$  cm
- $\frac{4}{5} - \frac{1}{3} = \frac{12}{15} - \frac{5}{15} = \frac{7}{15}$  km
- $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ ;  $\frac{1}{6}$  of 12 = 2 people
- $13 + 19 + 26 = 58$  cm
- $30 \div 2 = 15$   
 $15 \times 1 = 15$  days

### Lesson Practice 10A

- done
- done
- $\frac{15}{24} \div \frac{16}{24} = \frac{15 \div 16}{1} = \frac{15}{16}$
- $\frac{12}{16} \div \frac{8}{16} = \frac{12 \div 8}{1} = \frac{12}{8}$  or  $1\frac{4}{8}$
- $\frac{4}{8} \div \frac{2}{8} = \frac{4 \div 2}{1} = 2$
- $\frac{1}{2} \div \frac{1}{8} = \frac{8}{16} \div \frac{2}{16} = \frac{8 \div 2}{1} = 4$  times
- $\frac{2}{3} \div \frac{1}{6} = \frac{12}{18} \div \frac{3}{18} = \frac{12 \div 3}{1} = 4$  pieces
- $\frac{6}{8} \div \frac{1}{4} = \frac{24}{32} \div \frac{8}{32} = \frac{24 \div 8}{1} = 3$  people

### Lesson Practice 10B

- $\frac{12}{20} \div \frac{5}{20} = \frac{12 \div 5}{1} = \frac{12}{5}$  or  $2\frac{2}{5}$
- $\frac{18}{24} \div \frac{4}{24} = \frac{18 \div 4}{1} = \frac{18}{4}$  or  $4\frac{2}{4}$
- $\frac{3}{12} \div \frac{4}{12} = \frac{3 \div 4}{1} = \frac{3}{4}$
- $\frac{16}{24} \div \frac{15}{24} = \frac{16 \div 15}{1} = \frac{16}{15}$  or  $1\frac{1}{15}$
- $\frac{5}{20} \div \frac{16}{20} = \frac{5 \div 16}{1} = \frac{5}{16}$
- $\frac{3}{4} \div \frac{1}{8} = \frac{24}{32} \div \frac{4}{32} = \frac{24 \div 4}{1} = 6$  times
- $\frac{9}{10} \div \frac{1}{10} = \frac{9 \div 1}{1} = 9$  volunteers
- $\frac{5}{16} \div \frac{1}{16} = \frac{5 \div 1}{1} = 5$  times

### Lesson Practice 10C

- $\frac{6}{15} \div \frac{10}{15} = \frac{6 \div 10}{1} = \frac{6}{10}$
- $\frac{3}{6} \div \frac{2}{6} = \frac{3 \div 2}{1} = \frac{3}{2}$  or  $1\frac{1}{2}$
- $\frac{10}{15} \div \frac{12}{15} = \frac{10 \div 12}{1} = \frac{10}{12}$
- $\frac{8}{16} \div \frac{8}{16} = \frac{8 \div 8}{1} = 1$
- $\frac{5}{15} \div \frac{6}{15} = \frac{5 \div 6}{1} = \frac{5}{6}$
- $\frac{1}{3} \div \frac{1}{9} = \frac{9}{27} \div \frac{3}{27} = \frac{9 \div 3}{1} = 3$  people
- $\frac{4}{5} \div \frac{1}{10} = \frac{40}{50} \div \frac{5}{50} = \frac{40 \div 5}{1} = 8$  people

## Unit Test I

1.  $12 \div 3 = 4$ ;  $4 \times 2 = 8$
2.  $10 \div 5 = 2$ ;  $2 \times 3 = 6$
3.  $24 \div 4 = 6$ ;  $6 \times 3 = 18$
4.  $15 \div 3 = 5$ ;  $5 \times 1 = 5$
5.  $25 \div 5 = 5$ ;  $5 \times 4 = 20$
6.  $14 \div 7 = 2$ ;  $2 \times 5 = 10$
7.  $\frac{2}{6} = \frac{4}{12} = \frac{6}{18} = \frac{8}{24}$
8.  $\frac{5}{8} = \frac{10}{16} = \frac{15}{24} = \frac{20}{32}$
9.  $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
10.  $\frac{6}{24} + \frac{12}{24} = \frac{18}{24}$
11.  $\frac{6}{30} + \frac{25}{30} = \frac{31}{30} = 1\frac{1}{30}$   
(final step optional)
12.  $\frac{10}{15} - \frac{3}{15} = \frac{7}{15}$
13.  $\frac{7}{10} - \frac{3}{10} = \frac{4}{10}$
14.  $\frac{32}{56} - \frac{21}{56} = \frac{11}{56}$
15.  $\frac{21}{35} < \frac{25}{35}$
16.  $\frac{24}{48} = \frac{24}{48}$
17.  $\frac{16}{24} > \frac{12}{24}$
18.  $\frac{30}{80} + \frac{8}{80} = \frac{38}{80}$   
 $\frac{38}{80} + \frac{2}{5} = \frac{190}{400} + \frac{160}{400} = \frac{350}{400}$
19.  $\frac{6}{8} + \frac{7}{8} + \frac{4}{8} = \frac{17}{8} = 2\frac{1}{8}$   
(final step optional)
20.  $16 + 17 + 28 = 61$  m
21.  $46 + 23 + 46 + 23 = 138$  m
22.  $52 + 52 + 52 + 52 = 208$  cm
23. 90
24. 50
25. 600
26. 500
27.  $358 \div 5 = 71\frac{3}{5}$
28.  $541 \div 8 = 67\frac{5}{8}$
29.  $189 \div 6 = 31\frac{3}{6}$
30.  $67 \times 18 = 1206$
31.  $34 \times 26 = 884$
32.  $224 \times 22 = 4928$
33.  $\frac{2}{5} + \frac{1}{3} = \frac{6}{15} + \frac{5}{15} = \frac{11}{15}$  of her money
34.  $\frac{15}{18} > \frac{12}{18}$  so  $\frac{5}{6} > \frac{2}{3}$   
Dinner Plain received more snow.  
 $\frac{15}{18} - \frac{12}{18} = \frac{3}{18}$  m difference
35.  $10 + 11 + 10 + 11 = 42$  m  
 $\frac{1}{7}$  of 42 = 6 m of shelves

## Test 9

1.  $\frac{1}{4}$  of  $\frac{1}{3} = \frac{1}{12}$
2.  $\frac{3}{4} \times \frac{2}{5} = \frac{6}{20}$
3.  $\frac{2}{7} \times \frac{1}{4} = \frac{2}{28}$
4.  $\frac{2}{5}$  of  $\frac{3}{7} = \frac{6}{35}$
5.  $\frac{3}{5} \times \frac{1}{6} = \frac{3}{30}$
6.  $\frac{2}{4} \times \frac{1}{3} = \frac{2}{12}$
7.  $\frac{12}{44} + \frac{11}{44} = \frac{23}{44}$
8.  $\frac{24}{30} - \frac{5}{30} = \frac{19}{30}$
9.  $\frac{3}{21} + \frac{14}{21} = \frac{17}{21}$   
 $\frac{17}{21} + \frac{1}{2} = \frac{34}{42} + \frac{21}{42} = \frac{55}{42}$  or  $1\frac{13}{42}$
10.  $\frac{16}{24} > \frac{15}{24}$
11.  $\frac{36}{48} = \frac{36}{48}$
12.  $\frac{45}{54} > \frac{42}{54}$
13.  $(600) \times (50) = (30\ 000)$   
 $612 \times 54 = 33\ 048$
14.  $(100) \times (40) = (4000)$   
 $124 \times 36 = 4464$
15.  $(1000) \times (10) = (10\ 000)$   
 $957 \times 13 = 12\ 441$
16.  $\frac{1}{3} + \frac{2}{5} = \frac{5}{15} + \frac{6}{15} = \frac{11}{15}$  of the customers
17.  $10 + 12 + 12 = 34$  m
18.  $\frac{3}{8} \times \frac{1}{2} = \frac{3}{16}$  of the people

19.  $\frac{3}{8}$  of 48:  
 $48 \div 8 = 6$ ;  $6 \times 3 = 18$  had burgers  
 $\frac{3}{16}$  of 48:  
 $48 \div 16 = 3$ ;  $3 \times 3 = 9$  had mustard
20.  $48 \times \$15 = \$720$

### Test 10

- $\frac{2}{5} \div \frac{1}{5} = \frac{2 \div 1}{1} = 2$
- $\frac{15}{24} \div \frac{16}{24} = \frac{15 \div 16}{1} = \frac{15}{16}$
- $\frac{4}{8} \div \frac{2}{8} = \frac{4 \div 2}{1} = 2$
- $\frac{3}{12} \div \frac{4}{12} = \frac{3 \div 4}{1} = \frac{3}{4}$
- $\frac{27}{45} \div \frac{10}{45} = \frac{27 \div 10}{1} = \frac{27}{10}$  or  $2\frac{7}{10}$
- $\frac{12}{15} \div \frac{10}{15} = \frac{12 \div 10}{1} = \frac{12}{10}$  or  $1\frac{2}{10}$
- $\frac{3}{4} \times \frac{1}{4} = \frac{3}{16}$
- $\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$
- $\frac{2}{9} \times \frac{1}{2} = \frac{2}{18}$
- $\frac{32}{56} + \frac{21}{56} = \frac{53}{56}$
- $\frac{20}{36} - \frac{9}{36} = \frac{11}{36}$
- $\frac{4}{10} + \frac{3}{10} + \frac{5}{10} = \frac{12}{10}$  or  $1\frac{2}{10}$
- $(500) \div (40) \approx (10)$
- $(900) \div (30) = (30)$
- $(600) \div (60) = (10)$
- $\frac{1}{2} \div \frac{1}{10} = \frac{10}{20} \div \frac{2}{20} = \frac{10 \div 2}{1} = 5$  pieces
- $\frac{7}{8} \div \frac{1}{8} = \frac{7 \div 1}{1} = 7$  pieces
- $\frac{3}{10} + \frac{1}{10} = \frac{4}{10}$   
 $\frac{4}{10} + \frac{3}{5} = \frac{20}{50} + \frac{30}{50} = \frac{50}{50} = 1$  km
- $\frac{7}{8} - \frac{2}{8} = \frac{5}{8}$  or  $\frac{20}{32}$  of a pizza
- $365 \times 24 = 8760$  hours

### Test 11

- no
- yes
- no
- yes
- $\underline{1}, \underline{2}, \underline{4}, \underline{8}$   
 $\underline{1}, \underline{2}, \underline{3}, \underline{4}, \underline{6}, \underline{8}, \underline{12}, \underline{24}$   
 GCF = 8
- $\underline{1}, \underline{2}, \underline{5}, \underline{10}$   
 $\underline{1}, \underline{2}, \underline{4}, \underline{5}, \underline{10}, \underline{20}$   
 GCF = 10
- $\underline{1}, \underline{3}, \underline{13}, \underline{39}$   
 $\underline{1}, \underline{3}, \underline{5}, \underline{15}$   
 GCF = 3
- $\underline{1}, \underline{2}, \underline{7}, \underline{14}$   
 $\underline{1}, \underline{2}, \underline{4}, \underline{7}, \underline{14}, \underline{28}$   
 GCF = 14
- $\frac{1}{8} \times \frac{2}{7} = \frac{2}{56}$
- $\frac{2}{9} \times \frac{4}{5} = \frac{8}{45}$
- $\frac{3}{6} \times \frac{1}{6} = \frac{3}{36}$
- $\frac{2}{16} \div \frac{8}{16} = \frac{2 \div 8}{1} = \frac{2}{8}$
- $\frac{12}{18} \div \frac{3}{18} = \frac{12 \div 3}{1} = 4$
- $\frac{50}{60} \div \frac{18}{60} = \frac{50 \div 18}{1} = \frac{50}{18}$  or  $2\frac{14}{18}$
- $\frac{36}{48} = \frac{36}{48}$
- $\frac{30}{80} < \frac{32}{80}$
- $\frac{9}{18} < \frac{10}{18}$
- $673 \div 26 = 25\frac{23}{26}$
- $390 \div 82 = 4\frac{62}{82}$
- $768 \div 51 = 15\frac{3}{51}$