Solution Manual for Contemporary Mathematics for Business and Consumers Brief Edition

7th Edition Brechner Bergeman ISBN 1285448596 9781285448596

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Solution Manual:

Test Bank:

CHAPTER 2 : FRACTIONS

JUMP START WWW

Fo r each of the following, identify the t ype of frac tion and write it in word form.

1. $23\frac{4}{5}$
Mixed
Twenty-three and four-fifths

2. $\frac{12}{12}$
Improper
Twelve-twelfths

3. $\frac{15}{9}$
Improper
Fifteen-ninths

4. $\frac{7}{16}$
Proper
Seven-Sixteenths

5. $2\frac{1}{8}$
Mixed
Two and one-eighth

JUMP START WWW

Conver t the following improper frac tions to whole or mixed numbers.

6. $\frac{26}{8} = 3\frac{2}{8} = 3\frac{1}{4}$

7. $\frac{20}{6} = 3\frac{2}{6} = 3\frac{1}{3}$

8. $\frac{92}{16} = 5\frac{12}{16} = 5\frac{3}{4}$

9. $\frac{64}{15} = 4\frac{4}{15}$

10. $\frac{88}{11} = 8$

11. $\frac{33}{31} = 1\frac{2}{31}$

JUMP START WWW

Conver t the following mixed numbers to improper frac tions.

12. $6\frac{1}{2} = \frac{13}{2}$
$(6\times2+1=13)$

13. $11\frac{4}{5} = \frac{59}{5}$
$(11\times5+4=59)$

14. $25\frac{2}{3} = \frac{77}{3}$
$(25\times3+2=77)$

15. $18\frac{5}{8} = \frac{149}{8}$
$(18\times8+5=149)$

16. $1\frac{5}{9} = \frac{14}{9}$
$(1\times9+5=14)$

17. $250\frac{1}{4} = \frac{1,001}{4}$
$(250\times4+1 = 1,001)$

JUMP START WWW

u se inspec tion or the greatest common divisor to reduce the following frac tions to lowest terms.

19. $\frac{9}{12}$
$\frac{9 \div 3}{12 \div 3} = \frac{3}{4}$

20. $\frac{18}{48}$
$\frac{18 \div 6}{48 \div 6} = \frac{3}{8}$

21. $\frac{216}{920}$
$\frac{216 \div 8}{920 \div 8} = \frac{27}{115}$

$\frac{35 \div 7}{} = \frac{5}{27}$

$\frac{14}{}$

$\frac{9}{}$

$\frac{95}{}$

$27 \div 9 = 3$

$14 \div 14 = 1$

$9 \div 3 = 3$

$95 \div 5 = 19$

$36 \div 9$ $\dfrac{4}{}$ $112 \div 14$ $\dfrac{=}{8}$ $42 \div 3\underline{14}$ $325 \div 565$ $\dfrac{=}{}$

26. $\dfrac{8}{23}$ 27. $\dfrac{78}{96}$ 28. $\dfrac{30}{150}$ 29. $\dfrac{85}{306}$

$\dfrac{8}{23}$ = L ow es t ter ms $\dfrac{78 \div 6}{96 \div 6} = \dfrac{13}{16}$ $\dfrac{30 \div 30}{150 \div 305} = \dfrac{1}{}$ $\dfrac{85 \div 17}{306 \div 17} = \dfrac{5}{18}$

R aise the following frac tions to higher terms as indic ated.

JUMP
START
WWW

30. $\dfrac{2}{3}$ to twenty-sevenths

$\dfrac{2}{3} = \dfrac{18}{27}$ a $27 \div 3 = 9$ $9 \times 2 = 18$ b

31. $\dfrac{3}{4}$ to forty-eighths

$\dfrac{3}{4} = \dfrac{36}{48}$ a $48 \div 4 = 12$ $12 \times 3 = 36$ b

32. $\dfrac{7}{8}$ to eightieths

$\dfrac{7}{8} = \dfrac{70}{80}$ a $80 \div 8 = 10$ $10 \times 7 = 70$ b

33. $\dfrac{11}{16}$ to sixty-fourths

$\dfrac{11}{16} = \dfrac{44}{64}$ a $64 \div 16 = 4$ b $4 \times 11 = 44$

34. $\dfrac{1}{5}$ to hundredths

$\dfrac{1}{5} = \dfrac{20}{100}$ a $100 \div 5 = 20$ b $20 \times 1 = 20$

35. $\dfrac{3}{7}$ to ninety-eighths

$\dfrac{3}{7} = \dfrac{342}{98}$ $98 \div 7 = 14$ a $14 \times 3 = 42$ b

36. $\dfrac{3}{5} = \dfrac{15}{25}$ $25 \div 5 = 5$ a $5 \times 3 = 15$ b

37. $\dfrac{5}{8} = \dfrac{40}{64}$ $64 \div 8 = 8$ a $8 \times 5 = 40$ b

38. $\dfrac{5}{6} = \dfrac{300}{360}$ $360 \div 6 = 60$ a $60 \times 5 = 300$ b

39. $\dfrac{9}{13} = \dfrac{126}{182}$ $182 \div 13 = 14$ a $14 \times 9 = 126$ b

40. What fraction represents the laptops in this group of computers?

$\dfrac{3}{8}$

41. What fraction represents the screwdrivers in this group of tools?

$\dfrac{5}{11}$

42. A wedding cake was cut into 40 slices. If 24 of the slices were eaten, what fraction represents the eaten portion of the cake? Reduce your answer to lowest terms.

$\dfrac{24}{40} = \dfrac{3}{5}$ Was eaten

43. Jasmine Marley's swimming pool holds 16,000 gallons of water, and her spa holds 2,000 gallons of water. Of all the water in the pool and spa,

a. What fraction is the spa water?

$\dfrac{2,000}{2,000 + 16,000} = \dfrac{2}{18} = \dfrac{1}{9}$

b. What fraction is the pool water?

$\dfrac{16,000}{2,000 + 16,000} = \dfrac{16}{18} = \dfrac{8}{9}$

44. You work in the tool department at The Home Depot. Your manager asks you to set up a point-of-purchase display for a set of 10 wrenches that are on sale this week. He asks you to arrange them in order from smallest to largest on the display board. When you open the box, you find the following sizes in inches: $\dfrac{9}{32}, 5, \dfrac{5}{16}, 1, \dfrac{3}{2}, 3, 7, \dfrac{5}{48}, 1\dfrac{3}{8}$.

a. Rearrange the wrenches by size from smallest to largest.

To solve, raise all fractions to the LCD, 32 ; then arrange and reduce.

$\dfrac{5}{32}, \dfrac{3}{16}, \dfrac{1}{4}, \dfrac{9}{32}, \dfrac{5}{16}, \dfrac{3}{8}, 1, \dfrac{5}{2}, \dfrac{3}{4}, \dfrac{7}{8}$

b. Next your manager tells you that the sale will be " 1/3 off" the regular price of $57 and has asked you to calculate the sale price to be printed on the sign.

$\dfrac{2}{3} \times 57 = \underline{\$38}$

c. After the sale is over, your manager asks you for the sales figures on the wrench promotion. If 150 sets were sold that week, what amount of revenue will you report?

$\begin{array}{r} 150 \\ \times 38 \\ \hline \$5,700 \end{array}$

d. If $6,000 in sales was expected, what reduced fraction represents sales attained?

$\dfrac{5,700}{6,000} = \dfrac{19}{20}$

impr o v ement chain in the w or ld with appr o ximat ely 2, 250 st or es in the

Unit ed Stat es , P uer t o R ico , C anada, M exico , and China.
   L o w e 's is number t w o with about 1, 650 st or es .

BUsiNess DecisiON: evalUatiNg the QUestiON

45. You are on an academic committee tasked to evaluate state employment math test questions. The following question has come to the attention of the committee:

> "Each of the four digits 2, 4, 6 , and 9 is placed in one of the boxes to form a fraction. The numerator and the denominator are two-digit whole numbers. What is the smallest value of all the common fractions that can be formed? Express your answer as a reduced fraction."

Adapted from the NC TM Calendar, November 2004.

Some committee members contend this is not a valid question. Solve the problem and explain the solution to prove (or disprove) the question's validity.

$\frac{1}{4}$ To make a fraction as small as possible, make the numerator as small as possible and the denominator as large as possible. With the given digits, 2, 4, 6 , and 9 , the smallest two-digit number that can be formed is 24 and the largest two-digit number that can be formed is 96 . The fraction is $\frac{24}{96}$, which reduces to $\frac{1}{4}$. The test question is valid.

SECTIO N I I

2

Addition and S Ubtraction of F ractions

Adding and subtracting fractions occurs frequently in business. Quite often we must combine or subtract quantities expressed as fractions. To add or subtract fractions, the denominators

common denominator A common multiple of all the denominators in an addition or subtraction of fractions problem. A common denominator of the fractions $\frac{1}{5} + \frac{3}{8}$ is 40 .

must be the same. If they are not, we must find a common multiple, or **common denominator**, of all the denominators in the problem. The most efficient common denominator to use is the least common denominator, or LCD. By using the LCD, you avoid raising fractions to terms higher than necessary.

2-6

determining the least common denominator (lcd) of two or more fractions

least common denominator (LCD) The smallest and, therefore, most efficient common denominator in addition or subtraction of fractions. The least common denominator of the fractions $\frac{1}{4} + \frac{1}{6}$ is 20 .

The **least common denominator (LCD)** is the smallest number that is a multiple of each of the given denominators. We can often find the LCD by inspection (i.e., mentally) just by using the definition. For example, if we want to find the LCD of $\frac{1}{4}$ and $\frac{1}{6}$, we think (or write out, if we wish):

Multiples of 4 are 4, 8, 12, 16, 20, 24 , etc.
Multiples of 6 are 6, 12, 18, 24, 30 , etc.

By looking at these two lists, we see that 12 is the smallest multiple of both 4 and 6 . Thus, 12 is the LCD.

Sometimes, especially when we have several denominators or the denominators are relatively large numbers, it is easier to use prime numbers to find the LCD. A **prime number** is a whole number greater than 1 that is evenly divisible only by itself and 1 . Following are prime numbers:

prime number A whole number greater than 1 that is divisible only by itself and 1 . For example, 2, 3, 5, 7 , and 11 are prime numbers.

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, and s o on

STE

SteP 1. Write all the denominators in a row.

SteP 2. Find a prime number that divides evenly into any of the denominators. Write thatprimenumbertotheleft of the row and divide. Place all quotientsand undividednumbersin the next row down.

SteP 3. Repeat this process until the new row contains all ones.

SteP 4. Multiply all the prime numbers on the left to get the LCD of the fractions.

SECTIO N I I

2

Find the least common denominator for the following groups of frac tions. For problems 1–3, tr y finding the LCD by inspec tion (i.e., mentally) first, then use the prime -number method.

JUMP START WWW

1. $\dfrac{4}{5}, \dfrac{2}{3}, \dfrac{8}{15}$

```
3 5 3 1 5
5 5 1 5
1 1 1
```

$3 \times 5 = \underline{15}\text{LCD}$

2. $\dfrac{1}{■}, \dfrac{4}{9}, \dfrac{3}{4}$

```
2 3 9 4
2 3 9 2
3 3 9 1
3 1 3 1
1
1
1
```

$2 \times 2 \times 3 \times 3 = 36\text{LCD}$

3. $\dfrac{5}{6}, \dfrac{11}{1}, \dfrac{1}{1}$

```
2 6 1 2 4 2
2 3 6 2 1
3 3 6 1 1
6 1 2 4 2
1 1 1 1
```

$2 \times 2 \times 3 = 12\text{LCD}$

4. $\dfrac{1}{3}, \dfrac{19}{5}, \dfrac{2}{3}, \dfrac{3}{2}$

```
6 24 3 5
2 3 6 3 5
3 3 3 3 5
1 2 3 5
1 1 1 1
1 1 1 5
```

$2 \times 2 \times 2 \times 3 \times 5 = \underline{120}\text{LCD}$

5. $\dfrac{21}{9}, \dfrac{7}{1}, \dfrac{1}{2}$

```
2 5 6 0 2 0 3
2 5 3 0 1 0 3
3 2 5 1 5 5 3
5 2 5 5 5 1
5 5 1 1 1
1 1 1 1
```

$2 \times 2 \times 3 \times 5 \times 5 = 300\text{LCD}$

6. $\dfrac{5}{6}, \dfrac{9}{7}, \dfrac{2}{3}, \dfrac{7}{5}, \dfrac{2}{1}$

```
12143 10
6735
3735
1715
7 1 1
1 1 1 1
```

$2 \times 2 \times 3 \times 5 \times 7 = 420\underline{\text{LCD}}$

Add the following frac tions and reduce to lowest terms.

JUMP START WWW

7. $\dfrac{5}{6} + \dfrac{1}{2}$

```
5
6
3
6
= 1 = 1
6 6 3
```

8.
```
2 3 8
+
3 4 12
9
+
12
= 1
12 12
```

9.
```
5 13 10
+
8 16
13
+ 16
= 1
17 16
```

10.
```
9 29
16
32 32
9+ 2938
=132
32 32
= 3
16
```

11. $\dfrac{}{} + \dfrac{}{} \pm \dfrac{}{}$

```
25 20 20
16
20
+ 7
20
3
3
1
3
= 1
20 20
```

12. $\dfrac{}{} + \dfrac{}{} \pm \dfrac{}{}$

```
48 16 16
14
16
+ 5
16
31 15
= 1
16 16
```

13. $\dfrac{}{} + \dfrac{}{} \pm \dfrac{}{}$

```
12 5 30 60
36
60
+ 38
60
129 9 3
=2 = 2
60 60 20
```

14. $5\dfrac{4}{7} + 2\dfrac{12}{}$

```
7321
+ 14
2 2
1 4
5 26 = 5+1 5 = 6 5
21 21 21
```

$\dfrac{1}{} + 2\dfrac{7}{} + 1\dfrac{1}{} \quad 7\dfrac{12}{}$

```
2 8 6
2 21
24
+ 1 4
24
10 37 = 10+1 13 = 11 13
24
```

$\dfrac{5}{} + 45\dfrac{1}{} + 9\dfrac{7}{} \quad 13\dfrac{15}{}$

```
9327
```

```
27
4 5 9
27
+ 9 7
27
67 31 =67+1 4 = 68 4
67
```

24 24   24 27   27 27

17. Chet Murray ran $3\frac{1}{2}$ miles on Monday, $2\frac{4}{5}$ ~~miles~~ on Tuesday, and $4\frac{1}{8}$ ~~miles~~ on Wednesday. What was Chet's total mileage for the 3 days?

Monday 3 $\frac{1}{4}$ = 3 $\frac{20}{32}$

Tues day 2 = 2

Wednesday $4\frac{1}{8} = + 4\frac{5}{40}$

$9\frac{57}{40} = 9 + 1\frac{17}{40} = 10\frac{17}{40}$ Total miles

18. Crate and Barrel shipped three packages to New York weighing $45\frac{1}{5}$, $126\frac{3}{4}$, and $88\frac{3}{8}$ pounds. What was the total weight of the shipment?

$$45\frac{1}{5} = 45\frac{8}{40}$$
$$126\frac{3}{4} = 126\frac{30}{40}$$
$$+88\frac{3}{8} = +88\frac{15}{40}$$
$$\overline{\quad\quad} \quad \overline{\quad\quad}$$
$$259\frac{53}{40} = 259 + 1\frac{13}{40} = 260\frac{13}{40} \text{ Pounds}$$

19. At the Fresh Market, you buy $6\frac{3}{10}$ pounds of yams and $4\frac{1}{3}$ pounds of corn. What is the total weight of the purchase?

$$6\frac{3}{10} = 6\frac{9}{30}$$
$$+4\frac{1}{3} = +4\frac{10}{30}$$
$$\overline{\quad\quad}$$
$$10\frac{19}{30}$$

20. BrewMasters Coffee Co. purchased $12\frac{1}{2}$ tons of coffee beans in January, $15\frac{4}{5}$ tons in February, and $34\frac{7}{10}$ tons in March. What was the total weight of the purchases?

$$\text{J anuar y } 12\frac{1}{2} = 12\frac{5}{10}$$
$$\text{Febr uar y } 15\frac{4}{5} = 15\frac{8}{10}$$
$$\text{Mar ch } + 34\frac{7}{10} = +34\frac{7}{10}$$
$$\overline{\quad\quad}$$
$$61\frac{20}{10} = 61 + 2 = \underline{63} \text{ T ons}$$

Subtrac t the following frac tions and reduce to lowest terms.

21. $\dfrac{5}{6} - \dfrac{1}{4}$

$$\frac{5}{6} \to \frac{32}{63 \, 56}$$
$$-\frac{1}{3}$$

22. $\dfrac{4}{3} - \dfrac{1}{2}$

$$\frac{7}{66788} \to \frac{7\ 25}{56\ 56}$$

23. $\dfrac{2}{4} - \dfrac{1}{4}$

$$\frac{12}{18} \quad \frac{1\ 11}{18\ 18}$$

24. $\dfrac{3}{11} - \dfrac{9}{3}$

$$\frac{4\ 16}{16} \quad \frac{12}{16} \quad \frac{9\ 3}{16\ 16}$$

25. $12\frac{4}{5} - 4\frac{1}{3}$

$$= 12\frac{9}{15} - 4\frac{5}{15}$$
$$= 8\frac{4}{15}$$

26. $8\frac{3}{4} - 5\frac{?}{3}$

$$= 8\frac{3}{12} - 5\frac{8}{12}$$
$$= 7\frac{15}{12} - 5\frac{8}{12} = 2\frac{7}{12}$$

27. $28\frac{4}{9} - 1\frac{?}{5}$

$$= 28\frac{20}{45} - 1\frac{36}{45}$$
$$= 27\frac{65}{45} - 1\frac{36}{45} = 26\frac{29}{45}$$

28. $8\frac{?}{12} - 8\frac{?}{8}$

$$= 8\frac{22}{24} - 8\frac{9}{24} = \frac{13}{24}$$

29. Casey McKee sold $18\frac{4}{5}$ of his $54\frac{2}{3}$ acres of land. How many acres does Casey have left?

$$54\frac{2}{3} = 54\frac{10}{15} = 53\frac{25}{15}$$
$$-18\frac{4}{5} = -18\frac{12}{15} = -18\frac{12}{15}$$
$$\overline{\quad\quad}$$
$$35\frac{13}{15} \text{ A cr es lef t}$$

30. A particular dress requires $3\frac{1}{5}$ yards of fabric for manufacturing. If the matching jacket requires $\frac{4}{6}$ yard less fabric, how much fabric is needed for both pieces?

$$3\frac{1}{5} = 3\frac{13}{?} = \frac{39}{?}$$
$$3\frac{1}{5} = 3\frac{3}{?}$$

4412
5510
6612

29 5

4 12
5   5
+2 12 12   +2

8 2

$$\frac{}{12} = 2\frac{}{12}$$

Y ar ds f or jacket 5 = 5

T otal yar ds f or both pieces

$12\underline{\underline{3}}$

EXCEL 3

$$\frac{}{12} = 2\frac{}{12}$$

Y ar ds f or jacket 5 = 5

T otal yar ds f or both pieces

$12\underline{\underline{3}}$

EXCEL 2

31. Robert Burkart bought a frozen, factory-processed turkey that included the giblets and neck. The package weighed $22\frac{3}{7}$ pounds. Robert thawed the bird and then removed and weighed the giblets and neck, which totaled $1\frac{1}{8}$ ounces. The liquid that he drained from the package weighed $\frac{1}{2}$ pound. How much did the turkey weigh going into the oven?

$$1\frac{1}{8} \text{ Pounds — giblets and neck} \qquad\qquad 22\frac{3}{8} = 22\frac{6}{8}$$

$$+\frac{1}{2} \text{ Pounds — juice} \qquad\qquad -1\frac{5}{8} \frac{48}{} = -1\frac{5}{8}$$

$$1\frac{5}{8} \text{ Pounds — w eight los t af ter thaw ing}$$

and removing giblets and necks

32. Brady White weighed $196\frac{1}{8}$ pounds when he decided to join a gym to lose some weight. At the end of the first month, he weighed $191\frac{3}{8}$ pounds.

a. How much did he lose that month?

$$196\frac{1}{8} = 196\frac{4}{8}$$

$$-191\frac{3}{8} = -191\frac{3}{8}$$

$$5\frac{8}{}$$

b. If his goal is $183\frac{3}{4}$ pounds, how much more does he have to lose?

$$191\frac{3}{8} = 191\frac{3}{8} = 190\frac{11}{8}$$

$$-183\frac{3}{4} = -183\frac{6}{8} = -183\frac{6}{8}$$

$$7\frac{5}{8} \text{ Pounds}$$
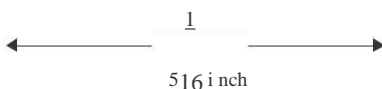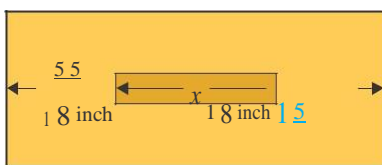
33. Hot Shot Industries manufactures metal heat shields for light fixture assemblies. What is the length, x , on the heat shield?

$1\frac{5}{8}$ inch $1\frac{5}{8}$ inch

$5\frac{1}{16}$ inch

$$5\frac{1}{8} = 4\frac{17}{16}$$

$$+1\frac{5}{8} \qquad\qquad -3\frac{1}{4} = -3\frac{4}{16}$$

$$2\frac{10}{8} = 3\frac{2}{8} = 3\frac{1}{4} \qquad\qquad 1\frac{13}{16} \text{ I nch}$$

34. Tim Kenney, a painter, used $6\frac{4}{5}$ gallons of paint on the exterior of a house and $9\frac{3}{4}$ gallons on the interior.

a. What is the total amount of paint used on the house?

$$6\frac{4}{5} = 6\frac{16}{20}$$

$$+9\frac{3}{4} = +9\frac{15}{20}$$

$$\qquad\qquad 15\frac{31}{20} = \qquad 11$$

$$\frac{15}{20} = \frac{16}{20}$$

b. If an additional $8\frac{3}{}$ gallons was used on the garage, what is the total amount of paint used on

$$\frac{15}{20} = \frac{16}{20}$$

b. If an additional $8\frac{3}{}$ gallons was used on the garage, what is the total amount of paint used on

the house and garage?

$$16\frac{11}{20} = 16\frac{11}{20}$$

$$+8\frac{3}{5} = +8\frac{12}{20}$$

$$24\frac{23}{20} = 25\frac{3}{20}$$

c. Rounding your answer from part b up to the next whole gallon, calculate the total cost of the paint if you paid $23 for each gallon.

$$\begin{array}{r} 26 \\ \times 23 \\ \hline \$598 \end{array} \text{ Total cost of paint}$$

EXCEL 2

BUsi N ess DecisiON: the ReD - eYe ex PRess

35. You are an executive with the Varsity Corporation in Atlanta, Georgia. The company presi-dent was scheduled to make an important sales presentation tomorrow afternoon in Seattle, Washington, but has now asked you to take his place.

    The trip consists of a $2\frac{1}{3}$ -hour flight from Atlanta to Dallas, a $1\frac{1}{4}$ -hour layover in Dallas, and then a $3\frac{3}{4}$ -hour flight to Portland. There is a $1\frac{1}{2}$ -hour layover in Portland and then a $\frac{3}{4}$ -hour flight to Seattle. Seattle is on Pacific Time, which is 3 hours earlier than Eastern Time in Atlanta.

    a. If you depart Atlanta tonight at 11:30 p.m . and all flights are on schedule, what time will you arrive in Seattle?

    $$2\frac{1}{2} + 1\frac{1}{4} + 3\frac{3}{4} + 1\frac{1}{2} + \frac{3}{4} = 9\frac{3}{4} \text{ H our s}$$

    11:30 P .M . + $9\frac{3}{4}$ hour s − 3- hour time dif f er ence = 6:15 A.M .

    b. If your return flight is scheduled to leave Seattle at 10:10 p.m. tomorrow night, with the same flight times and layovers in reverse, what time are you scheduled to arrive in Atlanta?

    10:10 P .M . + $9\frac{3}{4}$ hour s + 3- hour time dif f er ence = 10:55 A. M .

    c. If the leg from Dallas back to Atlanta is $\frac{2}{3}$ of an hour longer than scheduled due to headwinds, what time will you actually arrive?

    $\frac{2}{3}$ hour = 40 minutes

    10:55 A. M . + 40 minutes = 11:35 A. M .

2

SECTION

III

mUltiPlication and d ivision of f r actions

In addition and subtraction, we were concerned with common denominators; however, in m ul ti pl ic a ti on an d d iv i si on , c om mo n de no mi na t or s a r e n ot re qu ir e d. T his s im pl if ie s th e process considerably.

mUltiPlying f ractions and m ixed n Umbers

2-9

S TEPS Fo R Mu Ltip Ly ing F R AC tion S

SteP 1. Multiply all the numerators to form the new numerator. **S teP**

2. Multiply all the denominators to form the new denominator. **S teP**

3. Reduce the answer to lowest terms if necessary.

A procedure known as **cancellation** can serve as a useful shortcut when multiplying fractions. Cancellation simplifies the numbers with which we are dealing and often leaves the answer in lowest terms.

cancellation When multiplying fractions, cancellation is the process of finding a common factor that divides evenly into at least one numerator and one denominator. The common factor 2 can be used to cancel

$$\frac{1}{7} \times \frac{\overset{3}{\cancel{6}}}{} \text{ to } \frac{1}{} \times \frac{3}{}$$

472 7

EX A

Divide the following fractions.

a. $\frac{4}{5} \div \frac{2}{3}$

b. $6\frac{3}{8} \div 2\frac{1}{2}$

c. $12\frac{1}{6} \div 3$

Solution Strategy

a. $\frac{4}{5} \div \frac{2}{3} = \frac{4}{5} \times \frac{3}{2}$

In this example, invert the divisor, $\frac{2}{3}$, to form its reciprocal, $\frac{3}{2}$, and change the sign from "÷" to "×."

$$\frac{\overset{2}{4}}{5} \times \frac{3}{\underset{1}{2}} = \frac{6}{5} = 1\frac{1}{5}$$

Now multiply in the usual manner. Note that the 4 in the numerator and the 2 in the denominator can be reduced by the common factor 2. The answer, $\frac{6}{5}$, is an improper fraction and must be converted to the mixed number $1\frac{1}{5}$.

b. $6\frac{3}{8} \div 2\frac{1}{2} = \frac{51}{8} \div \frac{5}{2}$

First, convert the mixed numbers to the improper fractions $\frac{51}{8}$ and $\frac{5}{2}$; then state them again as division.

$$\frac{51}{8} \times \frac{2}{5}$$

Next, invert the divisor, $\frac{5}{2}$, to its reciprocal, $\frac{2}{5}$, and change the sign from "÷" to "×."

$$\frac{51}{\underset{4}{8}} \times \frac{\overset{1}{2}}{5} = \frac{51}{20} = 2\frac{11}{20}$$

Now multiply in the usual way. Note that the 2 in the numerator and the 8 in the denominator can be reduced by the common factor 2. The answer, $\frac{51}{20}$, is an improper fraction and must be converted to the mixed number $2\frac{11}{20}$.

c. $12\frac{1}{6} \div 3 = \frac{73}{6} \div \frac{3}{1}$

In this example, we have a mixed number that must be converted to the improper fraction $\frac{73}{6}$ and the whole number 3, which converts to $\frac{3}{1}$.

$$\frac{73}{6} \times \frac{1}{3}$$

The fraction $\frac{3}{1}$ is the divisor and must be inverted to its reciprocal, $\frac{1}{3}$. The × sign is changed from "÷" to "×."

$$\frac{73}{6} \times \frac{1}{3} = \frac{73}{18} = 4\frac{1}{18}$$

The answer is the improper fraction $\frac{73}{18}$, which converts to the mixed number $4\frac{1}{18}$.

According to The Wall Street Journal, the problem below was a question on the Jersey City High School admissions exam in June 1885! Try this for practice:

Divide the difference between 37 hundredths and 95 thousandths

express the result in words.

Answer: one thousand, one hundred

try it exerciSe 16

Divide the following fractions and mixed numbers.

a. $\frac{14}{25} \div \frac{4}{5}$

b. $11\frac{3}{16} \div 8\frac{2}{3}$

c. $18 \div 5\frac{3}{4}$

SECTION III 2

Multiply the following frac tions and reduce to lowest terms. u se c ancellation whenever possible.

JUMP START WWW

1. $\dfrac{2}{} \times \dfrac{4}{} = \dfrac{8}{}$

2. $\dfrac{5}{} \times \dfrac{1}{} = \dfrac{5}{}$

3. $\dfrac{1}{} \times \dfrac{4}{} = \dfrac{2}{}$

4. $\dfrac{7}{} \times \dfrac{1}{} \dfrac{4}{} = \dfrac{1}{}$

5. $\frac{16}{?} \times \frac{5}{?} = \frac{10}{?}$ 6. $\frac{25}{?} \cdot \frac{2}{?} \cdot \frac{10}{?}$ 7. $\frac{8}{11} \times \frac{33}{40} \times \frac{4}{?} \cdot \frac{12}{5} \cdot \frac{2}{5}$ 8. $\frac{2}{?} \cdot \frac{2}{?} \times \frac{6}{?} \cdot \frac{8}{33} \cdot \frac{2}{33}$

9. $8 \times 2 \times$ $= = 21$ 10. $\frac{1}{2} \cdot \frac{2}{?} \quad \frac{4}{?} \cdot \frac{3}{?} \cdot \frac{5}{?}$ 11. $\times \times =$

12. $\frac{2}{?} \times 5 \frac{4}{?} \times 9 \frac{2}{?} \quad \frac{29}{35} \times \frac{9}{35} = \frac{1744}{51}$

13. A recent market research survey showed that $\frac{3}{8}$ of the people interviewed preferred decaffeinated coffee over regular.

 a. What fraction of the people preferred regular coffee?

 $$= \frac{8-3=5}{8\ 8\ 8} = \text{Pref er r ed r egular}$$

 b. If 4,400 people were interviewed, how many preferred regular coffee?

 $$\frac{4,400}{1} \times \frac{5}{8\ 1} = \frac{2,750}{} = 2,750 \text{ People pr ef er r ed r egular}$$

14. Wendy Wilson planned to bake a triple recipe of chocolate chip cookies for her office party. If the recipe calls for $1\frac{3}{4}$ cups of flour, how many cups will she need?

 $$1\frac{3}{4} \times 3 = 5\frac{1}{4} \text{ C ups}$$

15. A driveway requires $9\frac{1}{2}$ truckloads of gravel. If the truck holds $4\frac{5}{8}$ cubic yards of gravel, how many total cubic yards of gravel are used for the driveway?

 $$9\frac{1}{2} \times 4\frac{5}{8} = \frac{19}{2} \times \frac{37}{8} = \frac{703}{} = 43\frac{15}{} \text{ C ubic yar ds of gr avel}$$

16. Melissa Silva borrowed $4,200 from the bank. If she has already repaid $\frac{3}{7}$ of the loan, what is the remaining balance owed to the bank?

 $$\frac{4,200}{1} \times \frac{3}{7\ 1} = \$1,800 \text{ A lr eady paid}$$

 4,200 T otal
 −1,800
 $2,400 Still ow ed

17. Amy Richards' movie collection occupies $\frac{5}{8}$ of her computer's hard drive. Her photography takes up $\frac{1}{6}$ of the drive. The operating system, application software, and miscellaneous files take up another $\frac{1}{2}$ of the drive. If her hard drive's capacity is 120 gigabytes, how many gigabytes of free space remain on the hard drive?

 $$\frac{5}{8} + \frac{1}{6} + \frac{1}{2} = \frac{15 + 4 + 2}{24} = \frac{21}{24} = \frac{7}{8} \text{ C apacity us ed } 1$$

 $$\frac{1}{8} \times 120 = \frac{15}{} \text{ G igabytes}$$

18. Three partners share a business. Max owns $\frac{3}{8}$, Sherry owns $\frac{2}{5}$, and Duane owns the rest. If the profits this year are $150,000, how much does each partner receive?

 $$\text{Max } \frac{150,000}{1} \times \frac{3}{8} = \frac{3\ 56,250}{} = \$56,250$$

 $$\text{Sher r y } \frac{150,000}{1} \times \frac{2}{5} = \frac{150,000}{} \times \frac{2}{5} = \frac{60,000}{1} = \$60,000$$

 D uane 56,250 150,000
 +60,000 −116,250
 116,250 $33,750

D ivide the following frac tions and reduce to lowest terms.

19. $\frac{5}{6} \div \frac{3}{8}$

 $$\frac{5}{6} \times \frac{8}{3} = \frac{20}{9} = 2\frac{2}{9}$$

20. $\frac{7}{10} \div \frac{1}{5}$

 $$\frac{7}{10} \times \frac{5}{1} = \frac{7}{2} = 3\frac{1}{2}$$

21. $\frac{2}{3} \div \frac{5}{8}$

 $$\frac{2}{3} \times \frac{8}{5} = \frac{16}{15} = 1\frac{1}{15}$$

22. $7 \div \frac{4}{5}$

23. $\frac{1}{3} \div \frac{5}{6}$

24. $\frac{9}{16} \div \frac{9}{16}$

Mark eting Resear ch M ar k et and sur v e y r esear chers gather inf or mation about what people think . T he y help companies understand what t ypes of pr oduc ts and ser vices people want and at what pr ice . B y gather ing statistical data on competit ors and examining pr ices , sales , and methods of mar k eting and distr ibution, the y advise companies on the most efficient wa ys of mar k eting their pr oduc ts .

 A ccor ding t o the U .S. Bur eau of Labor Statistics , o v erall emplo yment of mar k et and sur v e y r esear chers is pr ojec t ed t o g r o w 28 per cent fr om 2008 t o 2018. M edian annual salar ies f or mar k et r esear ch analysts in 2012 was $56, 000 .

75353

$\times$ = = 8

1444

25. $4 \cdot {}^4 \div {}^7$

162

355

1 11

26. $21\ \underline{1} \div 5\underline{2}$

9 16   1

$\times$ =   =1

1691

27. $18 \div \underline{18}$

$\dfrac{5}{8}$

$\dfrac{24}{8} \quad \dfrac{192}{17}$

$\times = = 5$

$5735 \qquad 35$

$\dfrac{2}{3}$

$\dfrac{43}{3} \quad \dfrac{129}{27}$

$\times = = 3$

$2 \ 17 \qquad 34 \ \dfrac{34}{}$

19

$\blacksquare^{1} \ \dfrac{19}{} \ 19 \qquad —$

$\times = \qquad = \underline{19}$

$1 \ 18 \ \diagup 1 \qquad 1 \qquad —$

28. $12 \div 1\dfrac{3}{}$

5

$\overset{3}{\underline{12}} \ 5 \ \dfrac{15}{} \ 1 \quad \times \ = = 7$

1822

$2 \ 6 \ \_ \ 5$

29. $\dfrac{15}{} \div \dfrac{7}{}$

$60 \ 10$

$\dfrac{15}{} \ 10^{1} \quad \dfrac{15}{} \ 5 \quad \times \qquad = =$

$60 \ 7 \qquad 42 \ \overline{14}$

30. $1\overset{1}{\blacksquare} \div 10$

5

$\overset{3}{\underline{6}} \ 1 \ \dfrac{3}{} \quad \times \ = \qquad —$

$51025 \qquad \diagup \qquad —$

31. Frontier Homes, Inc., a builder of custom homes, owns $126\frac{1}{2}$ acres of undeveloped land. If the property is divided into $2\frac{3}{4}$ -acre pieces, how many homesites can be developed?

$$126\frac{1}{2} \div 2\frac{3}{4} = \frac{253}{2} \div \frac{11}{4} = \frac{253}{2} \times \frac{4}{11} = 46 = 46 \text{ Homesites}$$

32. An automobile travels 365 miles on $16\frac{2}{3}$ gallons of gasoline.

a. How many miles per gallon does the car get on the trip?

$$365 \div 16\frac{2}{3} = \frac{365}{1} \div \frac{50}{3} = \frac{365}{1} \times \frac{3}{50} = \frac{219}{10} = 21\frac{9}{10} \text{ Miles per gallon}$$

b. How many gallons would be required for the car to travel 876 miles?

$$876 \div 21\frac{9}{10} = \frac{876}{1} \div \frac{219}{10} = \frac{876}{1} \times \frac{10}{219} = \frac{40}{1} = 40 \text{ Gallons}$$

33. Pier 1 Imports purchased 600 straw baskets from a wholesaler.

a. In the first week, $\frac{2}{5}$ of the baskets are sold. How many are sold?

$$\frac{600}{1} \times \frac{2}{5} = \frac{240}{1} = 240 \text{ Baskets sold first week}$$

b. By the third week, only $\frac{3}{20}$ of the baskets remain. How many baskets are left?

$$\frac{600}{1} \times \frac{3}{20} = 90 \text{ Baskets left third week}$$

EXCEL 2

34. At the Cattleman's Market, $3\frac{1}{2}$ pounds of hamburger meat are to be divided into 7 equal packages. How many pounds of meat will each package contain?

$$3\frac{1}{2} \div 7 = \frac{7}{2} \times \frac{1}{7} = \frac{1}{2} \text{ Pound}$$

35. Super Value Hardware Supply buys nails in bulk from the manufacturer and packs them into $2\frac{4}{5}$ -pound boxes. How many boxes can be filled from 518 pounds of nails?

$$518 \div 2\frac{4}{5} = \frac{518}{5} \div \frac{14}{15} = \frac{518}{5} \times \frac{5}{14} = \frac{185}{1} = 185 \text{ Boxes}$$

EXCEL 3

36. The chef at the Sizzling Steakhouse has 140 pounds of sirloin steak on hand for Saturday night. If each portion is $10\frac{1}{2}$ ounces, how many sirloin steak dinners can be served? Round to the nearest whole dinner. (There are 16 ounces in a pound.)

$$140 \text{ lb} \times 16 \text{ oz} = 2,240 \text{ Total ounces}$$

$$2,240 \div 10\frac{1}{2} = \frac{2,240}{1} \div \frac{21}{2} = \frac{2,240}{1} \times \frac{2}{21} = \frac{640}{3} = 213\frac{1}{3} = 213 \text{ Dinners}$$

37. Regal Reflective Signs makes speed limit signs for the state department of transportation. By law, these signs must be displayed every $\frac{5}{8}$ of a mile. How many signs will be required on a new highway that is $34\frac{3}{8}$ miles long?

$$34\frac{3}{8} \div \frac{5}{8} = \frac{275}{8} \div \frac{5}{8} = \frac{275}{8} \times \frac{8}{5} = 55 \text{ Signs}$$

38. Engineers at Triangle Electronics use special silver wire to manufacture fuzzy logic circuit boards. The wire comes in 840 -foot rolls that cost $1,200 each. Each board requires $4\frac{1}{5}$ feet of wire.

a. How many circuit boards can be made from each roll?

$$840 \div 4 = \frac{840}{5} \times \frac{21}{15} = \frac{840}{5} \times \frac{5}{1211} = \frac{200}{1} = 200 \text{ Circuit boards}$$

b. What is the cost of wire per circuit board?

$1,200 \div 200 = \underline{\$6}$ Each

39. At Celtex Manufacturing, a chemical etching process reduces $2\frac{13}{1664}$-inch copper plates by $\frac{35}{}$ of an inch.

   a. What is the thickness of each copper plate after the etching process?

   $$2\,16\frac{13}{}\quad 2\frac{52}{}64$$

   $$-\frac{35}{}64=\frac{35}{}64$$

   $$2\frac{17}{}64 \text{ I nches}$$

   b. How many etched copper plates can fit in a box 25 inches high?

   $$25\div2\frac{17}{64}=\frac{25}{1}\div\frac{145}{64}=\frac{25}{1}\times\frac{64}{145}=\frac{320}{29}=11\frac{1}{29}=11 \text{ Plates}$$

BUsi N ess DecisiON: DiNNeR s Pecial

40. You are the owner of The Gourmet Diner. On Wednesday nights, you offer a special of "Buy one dinner, get one free dinner—of equal or lesser value." Michael and Wayne come in for the special. Michael chooses chicken Parmesan for $15 , and Wayne chooses a $10 barbecue-combo platter.

   a. Excluding tax and tip, how much should each pay for his proportional share of the check?

   Michael $\frac{15}{25}=\frac{3}{55}$ $\frac{3}{5}\times15=$9$

   W ayne $\frac{10}{25}=\frac{2}{55}$ $\frac{2}{5}\times15=$6$

   b. If sales tax and tip amount to $\frac{1}{5}$ of the total of the two dinners, how much is that?

   $$\frac{1}{5}\times\frac{25}{1}=$5$$

   c. If they decide to split the tax and tip in the same ratio as the dinners, how much more does each owe?

   $$\frac{3}{5}\times5=$3$$

   $$\frac{2}{5}\times5=$2$$