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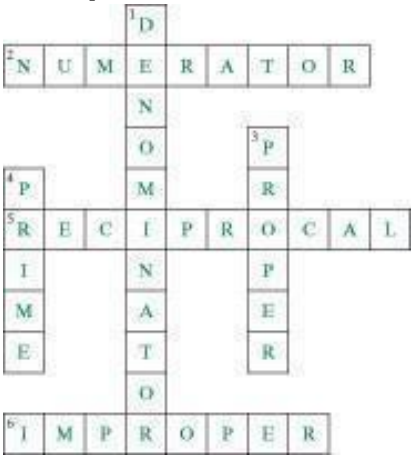
Chapter 2 Fractions and Mixed Numbers: Multiplication and Division

Chapter Opener Puzzle



Section 2.1 Introduction to Fractions and Mixed Numbers

Section 2.1 Practice Exercises

Answers will vary.

(a) A **fraction** is a part of a whole unit. The **numerator** of a fraction denotes the number of pieces of the whole being considered. The **denominator** of a fraction denotes the number of equal pieces into which a whole unit is divided. A fraction is a **proper fraction** if the numerator is less than the denominator.

An **improper fraction** is a fraction in which the numerator is greater than or equal to the denominator.

A **mixed number** is a sum of a whole number and a fractional part of a whole.

Numerator: 2; denominator: 3

Numerator: 8; denominator: 9

Numerator: 12; denominator: 11

Numerator 1; denominator: 2

$6 \div 1; 6$

$9 \div 1; 9$

$2 \div 2; 1$

$8 \div 8; 1$

$0 \div 3; 0$

$0 \div 7; 0$

$2 \div 0$; undefined

$11 \div 0$; undefined

$\frac{3}{4}$

$\frac{1}{2}$

$\frac{5}{9}$

$\frac{3}{5}$

$\frac{1}{6}$

$\frac{4}{7}$

$\frac{3}{8}$

$\frac{2}{3}$

$\frac{3}{4}$

$\frac{1}{4}$

$\frac{1}{8}$

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

27. $\frac{41}{103}$

28. $\frac{43}{103}$

29. $\frac{10}{21}$

$\frac{10}{63}$

Proper

Proper

Improper

Improper

Improper

Improper

Proper

Proper

$\frac{5}{2}$

$\frac{4}{3}$

$\frac{12}{4}$

42. $\frac{27}{9}$

43. $\frac{7}{4}; 1\frac{3}{4}$

44. $4; 3\frac{4}{5}$

45. $8; 1\frac{8}{8}$

$\frac{51}{2}; 2\frac{2}{2}$

47. $1\frac{3}{4} = \frac{4!1+3}{4} = \frac{7}{4}$

48. $\frac{1}{6}3 = \frac{6!3+1}{3} = \frac{19}{3}$

49. $\frac{2}{4}9 = \frac{4!9+2}{9} = \frac{38}{9}$

$\frac{3^1 = 3!5+1 = 16}{555}$

$\frac{3^3 = 3!7+3 = 24}{777}$

52. $\frac{2}{8}3 = \frac{8!3+2}{3} = \frac{26}{3}$

53. $7\frac{1}{4} = \frac{7!4+1}{4} = \frac{29}{4}$

$10\frac{3}{5} = \frac{10 \cdot 5 + 3}{5} = \frac{53}{5}$

$11\frac{5}{12} = \frac{11 \cdot 12 + 5}{12} = \frac{137}{12}$

$\frac{1}{12}$ $\frac{12 \cdot 6 + 1}{12}$ $\frac{73}{12}$

56. $12\frac{6}{21} = \frac{6 \div 3}{21 \div 3} = \frac{6}{171}$

57. $21\frac{8}{8} = \frac{8}{8} = 8$

58. $15\frac{1}{2} = \frac{15 \cdot 2 + 1}{2} = \frac{31}{2}$

$2\frac{3}{8} = \frac{2 \cdot 8 + 3}{8} = \frac{19}{8}$

eighths

$2\frac{3}{5} = \frac{2 \cdot 5 + 3}{5} = \frac{13}{5}$

13 fifths

$\frac{3}{4}$ $\frac{1 \cdot 4 + 3}{4}$ $\frac{7}{4}$ =

61. $1\frac{4}{4} =$

7 fourths

$\frac{25}{2}$ $\frac{3 + 2}{2}$ $\frac{17}{2}$ =

62. $5\frac{3}{3} =$

17 thirds

63. $8\overline{)37}$ $4\frac{5}{8}$

$\frac{32}{5}$

64. $7\overline{)13}$ $1\frac{6}{7}$

$\frac{7}{6}$

65. $5\overline{)39}$ $7\frac{4}{5}$

$\frac{35}{4}$

67. $10\overline{)27}$ $2\frac{7}{10}$

$\frac{20}{7}$

$18\overline{)43}$ $\frac{7}{18}$

$\frac{36}{7}$

$9\overline{)52}$ $\frac{7}{9}$

$\frac{45}{7}$

$12\overline{)67}$ $5\frac{7}{12}$

$\frac{60}{7}$

$11\overline{)133}$ $\frac{1}{11}$

$\frac{11}{23}$

$\frac{22}{}$

1

$5\overline{)10}$ $\frac{1}{5}$

$\frac{51}{50}$

1

3

$\overline{)23}$ 3

73. $\frac{18}{5}$

$\overline{)16}$ 4

3

6

6

.

4

1

9

4

4

74.

1
1
5
!7
4
5
!
4
2

75.

3

4
4
3
0
9
!
2
8
2
9
!
2
8

1 ___

3 _
5
6

1 _
6
3
7

4
4
1
7

76. $4\overline{)921}$ $230\frac{1}{4}$

$$\begin{array}{r} 230 \\ 4\overline{)921} \\ -8 \\ \hline 12 \\ -12 \\ \hline 1 \end{array}$$

77. $5\overline{)5281}$ $1056\frac{1}{5}$

$$\begin{array}{r} 1056 \\ 5\overline{)5281} \\ -5 \\ \hline 28 \\ -25 \\ \hline 31 \\ -30 \\ \hline 1 \end{array}$$

78. $8\overline{)7213}$ $901\frac{5}{8}$

$$\begin{array}{r} 901 \\ 8\overline{)7213} \\ -72 \\ \hline 13 \\ -8 \\ \hline 5 \end{array}$$

79. $11\overline{)8913}$ $810\frac{3}{11}$

$$\begin{array}{r} 810 \\ 11\overline{)8913} \\ -88 \\ \hline 11 \\ -11 \\ \hline 3 \end{array}$$

80. $23\overline{)4257}$ $185\frac{2}{23}$

$$\begin{array}{r} 185 \\ 23\overline{)4257} \\ -23 \\ \hline 195 \\ -184 \\ \hline 117 \\ -115 \\ \hline 2 \end{array}$$

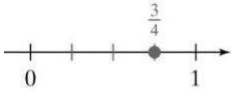
81. $15\overline{)187}$ $12\frac{7}{15}$

$$\begin{array}{r} 12 \\ 15\overline{)187} \\ -15 \\ \hline 37 \\ -30 \\ \hline 7 \end{array}$$

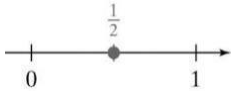
82. $34\overline{)695}$ $20\frac{15}{34}$

$$\begin{array}{r} 20 \\ 34\overline{)695} \\ -68 \\ \hline 15 \end{array}$$

83. Divide the distance between 0 and 1 into 4 equal parts.

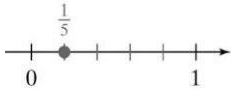


84. Divide the distance between 0 and 1 into 2 equal parts.

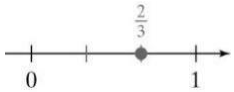


85. Divide the distance between 0 and 1 into 3 equal parts.

86. Divide the distance between 0 and 1 into 5 equal parts.



87. Divide the distance between 0 and 1 into 3 equal parts.



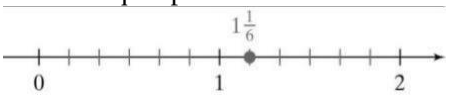
88. Divide the distance between 0 and 1 into 6 equal parts.

$\frac{}{2}$

55

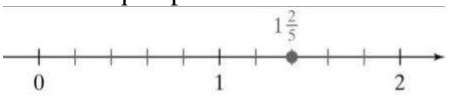
$\frac{7}{6} = 1\frac{1}{6}$

Divide the distance between 1 and 2 into 6 equal parts.



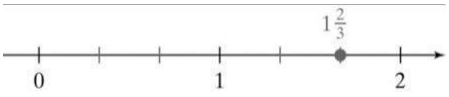
$\frac{7}{5} = 1\frac{2}{5}$

Divide the distance between 1 and 2 into 5 equal parts.



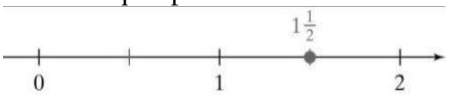
$\frac{5}{3} = 1\frac{2}{3}$

Divide the distance between 1 and 2 into 3 equal parts.



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

Divide the distance between 1 and 2 into 2 equal parts.



False; whole numbers cannot be written as proper fractions.

True

True

True

Section 2.2 Prime Numbers and Factorization

Section 2.2 Practice Exercises

Answers will vary.

(a) A **factor** of a number n is a nonzero whole number that divides evenly into n.

A **factorization** of a number n is a product of factors that equals n. A **prime number** is a whole number greater than 1 that has only two factors (itself and 1).

A **composite number** is a whole number greater than 1 that is not prime.

The **prime factorization** of a number is the factorization in which every factor is a prime number.

$\frac{4}{12}; \frac{}{12}$

$\frac{5}{6}; \frac{3}{4}$

5 ; improper

7

12 ; proper
12
6

6 ; improper
4

9. 5 23 4 3
2 2

!20 5
3

6 2 = 6!7+2 = 44
777

For example: 2 · 4 and 1 · 8

For example: $2 \cdot 10$ and $4 \cdot 5$

For example: $4 \cdot 6$ and $2 \cdot 2 \cdot 2 \cdot 3$

For example: $1 \cdot 14$ and $2 \cdot 7$

15.

Product	42	30	15	81
Factor	7	30	15	27
Factor	6	1	1	3
Sum	13	31	16	30

16.

Product	42	45	72	24
Factor	7	15	18	8
Factor	6	3	4	3
Sum	1	12	14	5

A whole number is divisible by 2 if it is an even number.

A whole number is divisible by 10 if its ones-place digit is 0.

A whole number is divisible by 3 if the sum of its digits is divisible by 3.

A whole number is divisible by 5 if its ones-place digit is 5 or 0.

45

No; 45 is not even.
Yes; 4 + 5 = 9 is divisible by 3.
Yes; the ones-place digit is 5.
No; the ones-place digit is not 0.

100

Yes; 100 is even.
No; 1 + 0 + 0 = 1 is not divisible by 3.
Yes; the ones-place digit is 0.
Yes; the ones-place digit is 0.

137

No; 137 is not even.
No; 1 + 3 + 7 = 11 is not divisible by 3.
No; the ones-place digit is not 0 or 5.
No; the ones-place digit is not 0.

241

No; 241 is not even.
No; 2 + 4 + 1 = 7 is not divisible by 3.
No; the ones-place digit is not 0 or 5.
No; the ones-place digit is not 0.

108

Yes; 108 is even.
Yes; 1 + 0 + 8 = 9 is divisible by 3.
No; the ones-place digit is not 0 or 5.
No; the ones-place digit is not 0.

1040

Yes; 1040 is even.
No; 1 + 0 + 4 + 0 = 5 is not divisible by 3.
Yes; the ones-place digit is 0.
Yes; the ones-place digit is 0.

3140

Yes; 3140 is even.
No; 3 + 1 + 4 + 0 = 8 is not divisible by 3.
Yes; the ones-place digit is 0.
Yes; the ones-place digit is 0.

2115

No; 2115 is not even.
Yes; 2 + 1 + 1 + 5 = 9 is divisible by 3.
Yes; the ones-place digit is 5.
No; the ones-place digit is not 0.

$$\begin{array}{r} 3 \\ 28\overline{)\,84} \\ \underline{!84} \\ 0 \end{array}$$

Yes, 84 is divisible by 28.

$$\begin{array}{r} 5 \\ 22\overline{)\,110} \\ \underline{!110} \\ 0 \end{array}$$

Yes, 110 is divisible by 22.

Prime

Prime

33. Composite $2 \cdot 5 = 10$

34. Composite $3 \cdot 7 = 21$

35. Composite $3 \cdot 17 = 51$

36. Composite $3 \cdot 19 = 57$

Prime

Prime

Neither

Neither

41. Composite $11 \cdot 11 = 121$

42. Composite $3 \cdot 23 = 69$

Prime

Prime

45. Composite $3 \cdot 13 = 39$

46. Composite $7 \cdot 7 = 49$

There are two whole numbers that are neither prime nor composite, 0 and 1.

False; the square of any prime number is divisible by that prime number.

False; 9 is not prime.

False; 2 is not composite.

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79

No, 9 is not a prime number.

No, 8 is not a prime number.

Yes

Yes

57. $5 \overline{)35}$, 7, $2 \overline{)70}$ $2 \cdot 5 \cdot 7 = 70$

58. $5 \overline{)55}$, 11, $3 \overline{)165}$, $3 \overline{)495}$ $3!3!5!11 = 3^2!5!11 = 495$

59. $5 \overline{)65}$, 13, $2 \overline{)130}$, $2 \overline{)260}$ $2!2!5!13 = 2^2!5!13 = 260$

60. $5 \overline{)35}$, 7, $5 \overline{)175}$ $5!5!7 = 5^2!7 = 175$

61. $7 \overline{)49}$, 7, $3 \overline{)147}$ $3!7!7 = 3!7^2 = 147$

62. $3 \overline{)51}$, 17, $2 \overline{)102}$ $2 \cdot 3 \cdot 17 = 51$

63. $3 \overline{)69}$, 23, $2 \overline{)138}$ $2 \cdot 3 \cdot 23 = 138$

64. $7 \overline{)77}$, 11, $3 \overline{)231}$ $3 \cdot 7 \cdot 11 = 231$

65. $7 \overline{)77}$, 11, $2 \overline{)154}$, $2 \overline{)308}$, $2 \overline{)616}$ $2!2!2!7!11 = 2^3!7!11 = 616$

66. $7 \overline{)912}$, 13, $2 \overline{)182}$, $2 \overline{)364}$ $2!2!7!13 = 2^2$

41 is prime.

47 is prime.

!7!13=364

1, 2, 3, 4, 6, 12

1, 2, 3, 6, 9, 18

1, 2, 4, 8, 16, 32

1, 5, 11, 55

1, 3, 9, 27, 81

1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

1, 2, 3, 4, 6, 8, 12, 16, 24, 48

1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

No; 30 is not divisible by 4. No;

46 is not divisible by 4.

Yes; 16 is divisible by 4.

Yes; 64 is divisible by 4.

Yes; 32 is divisible by 8.

Yes; 520 is divisible by 8.

No; 126 is not divisible by 8.

No; 58 is not divisible by 8.

Yes; 3 + 9 + 6 = 18 is divisible by 9.

Yes; 4 + 1 + 4 = 9 is divisible by 9.

No; 8 + 4 + 5 + 3 = 20 is not divisible by 9.

No; 1 + 5 + 8 + 7 = 21 is not divisible by 9.

Yes; 522 is even and 5 + 2 + 2 = 9 is

Yes; 546 is even and 5 + 4 + 6 = 15 is divisible by 3.

No; 5917 is not even.

No; 6 + 3 + 9 + 4 = 22 is not divisible by 3.

Section 2.3 Simplifying Fractions to Lowest Terms

Section 2.3 Practice Exercises

Answers will vary.

(a) A fraction is said to be in **lowest terms** if the numerator and denominator share no common factor other than 1.

The largest number that divides evenly into the numerator and denominator is call their **greatest common factor**.

3. $5\overline{)145}$ $5\cdot 29=145$

$3\overline{)57}$ $2\overline{)114}$ $2\cdot 3\cdot 19=114$

5. $2\overline{)46}$ $2\overline{)92}$ $2!2!23=2^2!23=92$

6. $3\overline{)51}$ $3\overline{)153}$ $3!3!17=3^2!17=153$

7. $5\overline{)85}$ $5\cdot 17=85$

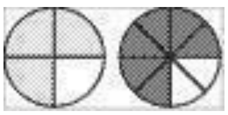
8. $3\overline{)15}$ $2\overline{)30}$ $2\overline{)60}$ $2\overline{)120}$ $2!2!2!3!5=2^3!3!5=120$

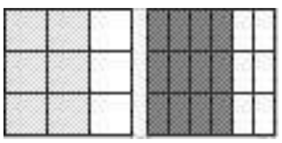
9. $3 \overline{)195}$, $5 \overline{)65}$, 13

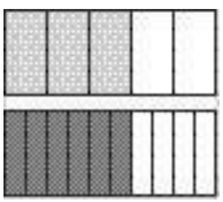
3·5·13=195

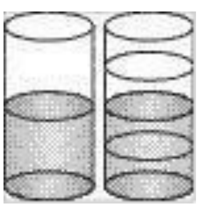
10. $2 \overline{)180}$, $2 \overline{)90}$, $3 \overline{)45}$, $3 \overline{)15}$, 5

2!2!3!3!5 = 2 2 !3 2 !5 = 180

11. 

12. 

13. 

14. 

False; 5 × 5 ≠ 4 × 4

Two fractions are equivalent if they both represent the same part of a whole.

2!5 ! 3!3

10"9

2 ! 3
3 5

1!9 ! 4!2

9 " 8

1 ! 2
4 9

1!6 ! 2!3

6 = 6

1 = 3

6!8 ! 16!3

48=48

6 = 3
16 8

12!4 !16!3

48=48

12 = 3
6 4

4!15!5 !
12

60=60

4 = 12
5 15

8!27 ! 9!20

216 " 180

8 ! 20
9 27

5!18 ! 6!12

90"72

5 ! 12
6 18

12 = 2!2!3 = 1
24 2!2!2!3 2

15 = 3!5 = 5
18 2!3!3 6

27. = 2!3 = 1
18 2!3!3 3

= 3!7 =
24 2!2!2! 3 8

36 = 2!2!3!3 = 9
2!2!5 5

49 = 7!7 =
42 2!3!7 6

$\frac{15}{12} = \frac{3 \cancel{/} 5}{2 \cancel{!} 2 \cancel{!} 3 \cancel{/} 4} = 5$

$\frac{30}{25 \cancel{!} 5 \cancel{/}} = \frac{2 \cancel{!} 3 \cancel{!} 5}{} \cancel{=} 6$

$\frac{20}{\cancel{2}5 \cancel{!} 5 \cancel{/}} = \frac{2 \cancel{!} 2 \cancel{!} 5}{} \cancel{=} 4$

$\frac{8}{16} = \frac{8 \cancel{/} 1}{2 \cancel{!} 8 \cancel{/} 2}$

$\frac{14}{14} = 1$

8

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

$\frac{50}{25} = \frac{2 \cancel{!} 25 \cancel{/}}{\cancel{/}} = 2$

$\frac{24}{66} = \frac{4 \cancel{!} 6}{\cancel{/}} = 4$

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

$\frac{2}{2} = 1$

$\frac{105}{140} = \frac{3 \cancel{!} 5 \cancel{!} 7}{2 \cancel{!} 2 \cancel{!} 5 \cancel{!} 7} \cancel{=} \frac{3}{4}$

42. $\frac{84}{126} = \frac{2 \cancel{!} 2 \cancel{!} 3 \cancel{!} 7}{2 \cancel{!} 3 \cancel{!} 3 \cancel{!} 7} = \frac{2}{3}$

$\frac{33}{3 \cancel{!} 11 \cancel{/}}$

$\frac{130}{150} = \frac{2 \cancel{!} 5 \cancel{!} 13}{2 \cancel{!} 3 \cancel{!} 5 \cancel{!} 5} = 13$

$\frac{70}{\cancel{!} 2 \cancel{!} 2 \cancel{!} 3 \cancel{!} 5} = \frac{2 \cancel{!} 5 \cancel{!} 7}{} = \frac{7}{12} \cancel{\frac{120}{2}}$

$\frac{385}{195} = \frac{5 \cancel{!} 7 \cancel{!} 11}{3 \cancel{!} 5 \cancel{!} 13} = \cancel{\frac{77}{39}}$

$\frac{39}{130} = \frac{3 \cancel{!} 13}{2 \cancel{!} 5 \cancel{!} 13} \cancel{=} 3 \quad 10$

$85 = \frac{2 \cancel{!} 17 \cancel{/} 2}{5 \cancel{!} 17 \quad 5}$

$\frac{69}{2 \cancel{!} 2 \cancel{!} 23 \quad 4} = \frac{3 \cancel{!} 23}{} \cancel{=} 3$

$\frac{6 \cancel{!} 2}{10+4} = \frac{4}{14} = \frac{2 \cancel{"} 2}{2 \cancel{"} 7} = \frac{2}{7}$

54. $\frac{9 \cancel{!} 1}{15+3} = \frac{8}{18} = \frac{2 \cancel{"} 2 \cancel{"} 2}{2 \cancel{"} 3 \cancel{"} 3} = \frac{4}{9}$

55. $\frac{5 \cancel{!} 5}{7 \cancel{!} 2} = \frac{0}{5} = 0$

$\frac{11 \cancel{!} 11}{} = \frac{0}{}$

56. $4 + 7 = 11 = 0$

57. $\frac{7 \cancel{!} 2}{5 \cancel{!} 5} = \frac{5}{0} =$ undefined

$\frac{4 + 7}{11 \cancel{!} 11} = \frac{11}{0} =$ undefined

58.

43. $\frac{11}{11} = 3$

44.

15+3

!133 **60.** = =

= 13

5

77=7!11=7

110 10 ! 10

85 = 5!17 =5

153 3!3! 9

15!3 12 6"2 2

120 12 2!2!3 3

61. = = =

16 2!2!2!2 4

720 =72= 8!9 = 9

800 80 8 !10 10

$\frac{3000}{1800} = \frac{30}{18} = \frac{2 \cdot 3 \cdot 5}{2 \cdot 3 \cdot 3} = \frac{5}{3}$

$\frac{2000}{1500} = \frac{20}{15} = \frac{2 \cdot 2 \cdot 5}{3 \cdot 5} = \frac{4}{3}$

$\frac{42,000}{22,000} = \frac{42}{22} = \frac{2 \cdot 3 \cdot 7}{2 \cdot 11} = \frac{21}{11}$

$\frac{50,000}{65,000} = \frac{50}{65} = \frac{2 \cdot 5 \cdot 5}{5 \cdot 13} = \frac{10}{13}$

67. $\frac{5100}{30,000} = \frac{51}{300} = \frac{3 \cdot 17}{3 \cdot 100} = \frac{17}{100}$

68. $\frac{9800}{28,000} = \frac{98}{280} = \frac{2 \cdot 7 \cdot 7}{2 \cdot 2 \cdot 2 \cdot 5 \cdot 7} = \frac{7}{20}$

Heads: $\frac{2 \cdot 2 \cdot 5 \cdot 5}{48} = \frac{}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} = \frac{}{12}$ Tails: $48 - 20 = 28$

$= \frac{2 \cdot 2 \cdot 7}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} = \frac{7}{12}$

$\frac{}{105} = \frac{2 \cdot 5 \cdot 7}{3 \cdot 5 \cdot 7} = \frac{2}{3}$

$\frac{6}{26} = \frac{2 \cdot 3}{2 \cdot 13} = \frac{3}{13}$

71. (a)

$26 - 6 = 20$

$= \frac{2 \cdot 2 \cdot 5}{2 \cdot 13} = \frac{10}{13}$

(a) $\frac{12}{88} = \frac{2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 11} = \frac{3}{22}$

$\frac{36}{88} = \frac{2 \cdot 2 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 11} = \frac{9}{22}$

$\frac{25}{30} = \frac{5 \cdot 5}{5 \cdot 6} = \frac{5}{6}$

73. (a) Jonathan: $= \frac{}{35} = \frac{5 \cdot 7}{5 \cdot 7} = \frac{}{7}$

Jared: $\frac{24}{28} = \frac{2 \cdot 2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 7} = \frac{6}{7}$

Jared sold the greater fractional part because $\frac{6}{7} > \frac{5}{7}$.

$\frac{15}{24} = \frac{3 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 3} = \frac{5}{8}$

(a) Lynette: $24 = 2 \cdot 2 \cdot 2 \cdot 3 = 8$

Lisa: $\frac{14}{16} = \frac{2 \cdot 7}{2 \cdot 2 \cdot 2 \cdot 2} = \frac{7}{8}$

(b) Lisa has completed more of her course because $\frac{7}{8} > \frac{5}{8}$.

75. (a) Raymond:

$= \frac{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 11} = \frac{10}{11}$

Travis: $\frac{540}{660} = \frac{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 5}{2 \cdot 2 \cdot 3 \cdot 5 \cdot 11} = \frac{9}{11}$

Raymond read the greater fractional part because $\frac{10}{11} > \frac{9}{11}$.

(a) $\frac{}{27} = \frac{3 \cdot 5}{3 \cdot 3 \cdot 3} = \frac{5}{9}$

$\frac{}{36} = \frac{2 \cdot 2 \cdot 2 \cdot 4}{2 \cdot 2 \cdot 3 \cdot 3} = \frac{}{9}$

(a) 300,000,000

36,000,000

$\frac{36,000,000}{300,000,000} = \frac{36}{300}$

$= \frac{2 \cdot 3 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 3 \cdot 5 \cdot 5} = \frac{3}{25}$

(a) 300,000,000

75,000,000

$\frac{300,000,000}{75,000,000} = \frac{300}{75}$

$$= \frac{2!2!3!5!5}{3!5!5} = \frac{4}{1}$$

4 times greater

79. For example, $\frac{6}{8}, \frac{9}{12}, \frac{12}{16}$

80. For example, $\frac{2}{6}, \frac{3}{9}, \frac{4}{12}$

81. For example, $\frac{6}{9}, \frac{4}{6}, \frac{2}{3}$

82. For example, $\frac{40}{50}, \frac{8}{10}, \frac{4}{5}$

83. $\frac{792}{891} = \frac{8}{9}$

84. $\frac{728}{784} = \frac{13}{14}$

85. $\frac{779}{969} = \frac{41}{51}$

86. $\frac{462}{220} = \frac{21}{10}$

87. $\frac{493}{510} = \frac{29}{30}$

88. $\frac{871}{469} = \frac{13}{7}$

89. $\frac{969}{646} = \frac{3}{2}$

90. $\frac{713}{437} = \frac{31}{19}$

Section 2.4 Multiplication of Fractions and Applications

Section 2.4 Practice Exercises

Pages 152−156; answers will vary.

A **power of one-tenth** is 10^{-1} raised to a whole-number power.

Numerator: 10; denominator: 14

$$= \frac{2 \cdot 5}{2 \cdot 7} = \frac{5}{7}$$

Numerator: 32; denominator: 36

$$= \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 3 \cdot 3} = \frac{8}{9}$$

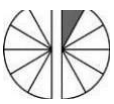
Numerator: 25; denominator: 15

$$\frac{25}{3 \cdot 5} = \frac{5 \cdot 5}{3 \cdot 5} = \frac{5}{3}$$

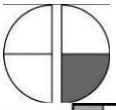
Numerator: 2100; denominator: 7000

$$\frac{2100}{7000} = \frac{21}{70} = \frac{3 \cdot 7}{2 \cdot 5 \cdot 7} = \frac{3}{10}$$

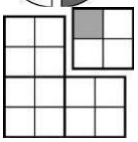
7.



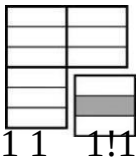
8.



9.



10.



$$\frac{1}{4} \cdot \frac{1}{6} = \frac{1 \cdot 1}{24} = \frac{1}{8}$$

$$\frac{2}{35} \cdot \frac{1}{3 \cdot 5} = \frac{2 \cdot 1}{35 \cdot 15} = \frac{2}{525}$$

$$4\frac{3}{8} \cdot 4\frac{3}{8} = \frac{35}{8} \cdot \frac{35}{8} = \frac{1225}{64}$$

$$5\frac{2}{5} \cdot 20 = \frac{27}{5} \cdot \frac{20}{1} = \frac{540}{5} = 108$$

13 1!3 3

! = =

282!816

2

1

2

! = =

333!39

14 1 14!1 14

! = =

9 9 9!9 81

1 9 1!9 9

! = = =

18. 8 8 8!8 64

"12#"2# 12!2 24

19. $ %$ % = =

& 7 '&5' 7 ! 5 35

" 9 #"7# 9 ! 7 63

=

20. $ %$ % =

&10'&4' 10! 4 40

" 1 # 8 1 8 !1 8

=

21. 8!$ % ! = =

&11' 1 11 1!11 11

" 2 # 3 2 3 ! 2 6

=

22. 3!$ % = =

& 7 ' 1 7 1! 7 7

23. 4 . 4 ! 6 = 4 ! 6 24

5 5 1 5 !1 5

5 5 5 5!5 25

24. !5= ! = = =

8 8 1 8!1 8

25. 13 !5= 13!5= 65

949!436

6!7=6!7=42

555!525

27. 2 ! 3 = 2 !3 =2

9 5 3 " 3 5 15

28. $\frac{1}{} ! \frac{4}{} = \frac{1}{} ! \frac{4}{} = \frac{1}{}$

21!25= 3!7! 5!5 =35
5 125 2!2!34

16 15 16 3 ! 5 3

32. 25!32
=5!5!2![redacted]
=10

33. 24 ! 5 = 2!2!2! 3 ! 5 = 8
15 3 3 ! 5 3 3

49 6 7!72!3 7

34. 24 ! 7 = 2 !2!2! 3 ! 7 = 4

" 6 #"22# 6!22 2! 3!2!11 4
35.$ %$ % = = =
&11'& 15 ' 11!15 11!3!5 5

"12#"5# 12!5 3!4!5 1
36.$ %$ % = = =
&45'&4' 45!4 3!3!5!4 3

"17 #" 72 # 17!72 17 !8! 9 8
37.$ %$ % = = = = 8
& 9 '&17' 9 !17 9!17 1

"39#"11#=

39!11=

3!13 !11 =

3 =3
$%$ %
&11'&13 ' 11!13 [redacted] 1

21!16=

3!7 ! 4!4

=12 =12
47471

85!12= 5!17!2!2!3 =17 =17
6 10 2!3 2!5 1

15 2!2!3 3!5 30
" . =

41. 12" 42 = 1 2!3!7 7

42. 4"8=2!2"2!2!2 =8
92 1 2!2!23 23

5 43 . 9!16 !25 3 " 5
10

15 3 8
3 " 3

= !

2 " 5 " 5
2 "
2 " 2"2"2

!
3

29. 6 ! 4 = 2" 3 ! 4 = 8 = 1=10

30. 7 "18 = 7 " 2!3!3 = 21
12 5 2!2!3 5 10

44. 49 ! 4 ! 20 = 7 " 7 ! 2 " 2 ! 2"2"5
8 5 7 2"2"2 5 7

= 14 = 14
1

5 10 7 5 2!575
" " = " " =
2 21 5 2 3!7 5 3

55 18 24

9 ! 32 ! 11

[redacted]

5"
2"2"2"3 2"3"3

= 3 " 3 ! 2"2"2"2"2 ! 11

1

5

2

47. 7 ! 3 ! 5 = 7 ! 3 ! 5 = 3

10 28 2 ! 5 2!2! 7 1 8

48. 2 !15 = 11 ! 2 ! 3 ! 5 = 11
11

18 20 2!3!3 2!2! 5 1 12

100 14 2"2"5"5 3 " 7 2 " 7

49. !21! = !
!

49 25 7 " 7 1 5 " 5

2
4

= = 24
1

$

50. 38 "11" 5 2!19 11 5 5 = 5

22 19 2!11 1191

6
1
.

1 $ 9
10 &
"—%

Ä Ā Ā

1, 1, 1, 1, 1, 1, 1, 1, 1
0 10 10 10 10 10 10 10 10

Ä Ā Ā

1,000,000,000

2

1" 11 1
$%=#=

9' 99 81

2

!1" =1#1= 1

$4% ,

3

!3" =3#3#3=27

$ %

2 2228&'

3

!4" =4#4#4=64

$ %
3 333 27 & '

!4# 3 3 " = ! 4 # 3 " 3 =3 3 =27

% %
$ 4 $ 1 4
& ' ' '
! 2 5 2 3 3

60. 5# " 3 =! # " =2 =8

% $ %
& 5 ' & 1 5 '

1
2 2
!1 3" !1" 1 1 1

=
$ # % $ % = # =
& 9 5' & 15' 15 15 225

! 1 " 3 1 1 1 1 3

51. $ − % = - - - − # · - - —

&

1

0 ' 10 10 10 1000

1

4

!1" 1 1 1 1 1

" 10 1 # 2 " 1# 2 1 1 1

52. $ %= # # # =

&10 ' 10 10 10 10 10, 000

62. $! % = $ % = ! =

& 3 100 ' &30' 30 30 900

6

!1" 1 . 1 . 1 1 . 1 1

53.$ %= # # # # 3 2 2

&10 ' 10 10 10 10 10 10 1 "21 8 # 1 6

$= \frac{1}{1{,}000{,}000}$

63. $\left(\frac{4}{3}\right)^{-1} = \frac{3}{4}$

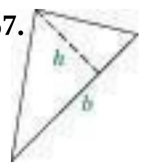
$\left(\frac{1}{24}\right)^{\frac{1}{3}} = \frac{1}{\sqrt[3]{24}} = \frac{1}{\sqrt[3]{8 \cdot 3}} = \frac{1}{2\sqrt[3]{3}}$

64. $\left(\frac{5}{8}\right)^{-1} = \frac{8}{5}$

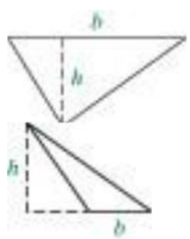
65. $\frac{16}{9}\cdot\left(\frac{1}{2}\right)^3 = \frac{\overset{2}{\cancel{16}}}{9}\cdot\frac{1}{\underset{1}{\cancel{8}}} = \frac{2}{9}$

66. $\frac{28}{6}\cdot\left(\frac{3}{2}\right)^2 = \frac{\overset{7}{\cancel{28}}}{\underset{2}{\cancel{6}}}\cdot\frac{\overset{3}{\cancel{9}}}{\underset{1}{\cancel{4}}} = \frac{21}{2}$

67.

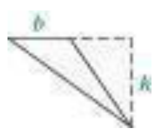


68.



69.

70.



$A = \frac{1}{2}bh = \frac{1}{2}(11)(8) = \frac{1}{\underset{1}{\cancel{2}}}\cdot\frac{11}{1}\cdot\frac{\overset{4}{\cancel{8}}}{1} = 44\text{ cm}^2$

$A = \frac{1}{2}bh = \frac{1}{2}(15)(12) = \frac{1}{\underset{1}{\cancel{2}}}\cdot\frac{15}{1}\cdot\frac{\overset{6}{\cancel{12}}}{1} = 90\text{ in.}^2$

$A = \frac{1}{2}bh = \frac{1}{2}(8)(8) = \frac{1}{\underset{1}{\cancel{2}}}\cdot\frac{\overset{4}{\cancel{8}}}{1}\cdot\frac{8}{1} = 32\text{ m}^2$

75. $A = \frac{1}{2}bh = \frac{1}{2}(5)\left(1\frac{3}{5}\right) = \frac{1}{\underset{1}{\cancel{2}}}\cdot\frac{\overset{1}{\cancel{5}}}{1}\cdot\frac{\overset{4}{\cancel{8}}}{\underset{1}{\cancel{5}}} = 4\text{ yd}^2$

76. $A = \frac{1}{2}bh = \frac{1}{2}(3)\left(\frac{16}{9}\right) = \frac{1}{\underset{1}{\cancel{2}}}\cdot\frac{\overset{1}{\cancel{3}}}{1}\cdot\frac{\overset{8}{\cancel{16}}}{\underset{3}{\cancel{9}}} = \frac{8}{3}\text{ or }2\frac{2}{3}\text{ mm}^2$

$A = l\cdot w = \frac{\overset{1}{\cancel{3}}}{4}\cdot\frac{1}{\underset{1}{\cancel{3}}} = \frac{1}{4}\text{ cm}^2$

$A = l\cdot w = \frac{8}{3}\cdot 3 = \frac{8}{\underset{1}{\cancel{3}}}\cdot\frac{\overset{1}{\cancel{3}}}{1} = 8\text{ m}^2$

79. $A = l\cdot w = \frac{13}{16}\cdot\frac{15}{16} = \frac{195}{256}\text{ in.}^2$

$A = l\cdot w = \frac{23}{\underset{8}{\cancel{24}}}\cdot\frac{\overset{1}{\cancel{3}}}{4} = \frac{23}{32}\text{ ft}^2$

$A = (8)(4) + \frac{1}{2}(8)(4) = 32 + 4\cdot 4 =$

$32 + 16 = 48\text{ yd}^2$

$A = (8)(3) + \frac{1}{2}(8)(3) = 24 + 4\cdot 3 =$

$24 + 12 = 36\text{ m}^2$

83. $A = \frac{1}{2}(6)\left(\frac{7}{}\right) + \frac{1}{2}(6)\left(\frac{2}{}\right)$ … $7 + 3\frac{1}{2}$

$A = \frac{1}{2}bh = \frac{1}{2}\left(1\frac{7}{4}\right)(1) = \frac{1}{2} \cdot \frac{7}{4} = \frac{7}{8}\ \text{ft}^2$

$= \frac{3}{2} \cdot \frac{7}{3} + \frac{3}{2} \cdot \frac{2}{3} = 7 + 2 = 9$ cm

84. $A = \frac{1}{2}(8)\left(\frac{9}{4}\right) + \frac{1}{2}(8)\left(\frac{15}{4}\right) = 4 \cdot \frac{9}{4} + 4 \cdot \frac{15}{4}$

$$= 1\frac{4}{9} + 1\frac{4}{15} = 9 + 15 = 24 \text{ m}^2$$

85. $\frac{8}{1} \cdot 16 = \frac{8}{1} \cdot \frac{2}{1} = 10$

The amount left is 10 gal.

$\frac{3}{441} \cdot 11{,}000 = \frac{3}{1} \cdot \frac{11{,}000}{1} = 8250$

The cost is \$8250.

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

Jim ate $\frac{1}{8}$ of the pizza for breakfast.

$1\frac{1}{2} \cdot \frac{1}{5} = \frac{1}{10}$

$\frac{1}{10}$ of the sample has O negative blood.

$\frac{2}{331} \cdot 9{,}825{,}000 = \frac{2}{1} \cdot$ [redacted]

6,550, 000

There are 6,550,000 viewers.

$3\frac{1}{4} = \frac{13}{4} \cdot \frac{4}{9} = \frac{4}{9}$ or $2\frac{1}{4}$ hr

Nancy spends $\frac{4}{400}$ or $2\frac{4}{400}$ a day.

First place: $\frac{2}{3} \cdot 1200 = \frac{2}{3} \cdot$ [redacted] $= \$800$

300

92. $\frac{3}{1} \cdot (40)(36) = \frac{3}{1} \cdot \frac{12}{1} \cdot 1 = 960$

$40 \times 36 = 1440$

$1440 - 960 = 480$

Frankie mowed 960 yd^2. He has 480 yd^2

(a) $\left(\frac{1}{6}\right)^2 = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

(b) $\sqrt{\frac{1}{36}} = \frac{1}{6}$

94. (a) $\left(\frac{2}{7}\right)^2 = \frac{2}{7} \cdot \frac{2}{7} = \frac{4}{49}$

$\sqrt{\frac{4}{49}} = \frac{2}{7}$

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

$\sqrt{\frac{11}{100}} = \frac{\sqrt{11}}{10}$

$\sqrt{\frac{64}{81}} = \frac{8}{9}$

98. $\sqrt{\frac{9}{4}} = \sqrt{\frac{3}{2} \cdot \frac{3}{2}} = \frac{3}{2}$

99. $\frac{1}{2}, \frac{1}{4} = \frac{1}{2} \cdot \frac{1}{2}, \frac{1}{8} = \frac{1}{4}, \frac{1}{16}$

The next number is $16 \cdot 2 = 32$.

Second place: $\frac{1}{3}\cdot 1200 = \frac{1}{3}\cdot 1200 = \$300$

100. $\frac{2}{3}, \frac{2}{9} = \frac{2}{3\cdot 3}, \frac{2}{27} = \frac{2}{9\cdot 3}$

$$\frac{4}{1}\cdot\frac{4}{1}\cdot\frac{1}{27}=\frac{2}{3}\cdot\frac{2}{3}\cdot\frac{1}{3}=\frac{4}{81}$$

The next number is $\frac{2}{3}\cdot\frac{2}{3}=\frac{4}{9}$.

Third place: $\frac{1}{12}\cdot 1200=\frac{1}{12}\cdot\frac{100}{1}\cdot\frac{1200}{1}=\$100$

101. $\frac{1}{2} \div 1\frac{1}{8} = \frac{1}{2} \cdot \frac{8}{9} = \frac{8}{18} = \frac{4}{9}$

$1\frac{1}{8} \div \frac{1}{2} = \frac{9}{8} \cdot \frac{2}{1} = \frac{18}{8} = \frac{9}{4}$

They are the same.

102. $\frac{1}{2} \div 1\frac{1}{2} = \frac{1}{2} \cdot \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$

$1\frac{1}{2} \div \frac{1}{2} = \frac{3}{2} \cdot \frac{2}{1} = \frac{6}{2} = 3$

They are the same.

Section 2.5 Division of Fractions and Applications

Section 2.5 Practice Exercises

Page 143 Answers

will vary.

To find the **reciprocal** of a nonzero fraction, interchange the numerator and denominator.

$\frac{9}{22} \div \frac{18}{11} = \frac{9}{22} \cdot \frac{11}{18} = \frac{1 \cdot 1 \cdot 11}{2 \cdot 11 \cdot 2 \cdot 9} = \frac{1}{4}$

$24\frac{7}{8} \div 3 = \frac{199}{8} \cdot \frac{1}{3} = \frac{199}{24} = 8\frac{7}{24}$

$3\frac{4}{5} \div 5\frac{17}{25} = \frac{19}{5} \cdot \frac{25}{142} = \frac{19 \cdot 5 \cdot 5}{5 \cdot 142} = \frac{95}{142}$

6. $\frac{3}{7} \div 7 = \frac{3}{7} \cdot \frac{1}{7} = \frac{3}{49}$

$3\frac{6}{7} \div 1\frac{2}{3} = \frac{27}{7} \cdot \frac{3}{5} = \frac{81}{35} = 2\frac{11}{35}$

7. $8\frac{5}{24} \div 3 = \frac{197}{24} \cdot \frac{1}{3} = \frac{197}{72} = 2\frac{53}{72}$

$\frac{1}{10} \div 10 = \frac{1}{10} \cdot \frac{1}{10} = \frac{1}{100}$

10. $\frac{10}{10} \div 10 = \frac{10}{10} \cdot \frac{1}{10} = \frac{10}{100} = 1$

$3 \div 3\frac{1}{3} = \frac{3}{1} \cdot \frac{3}{10} = \frac{9}{10}$

11. $3 \div 3\frac{1}{3} = \frac{3}{1} \cdot \frac{3}{10} = \frac{9}{10}$

12. **(a)** Yes, $1\frac{1}{2} = 2$

(b) Yes, $\frac{3}{5}$

(c) Yes, $\frac{1}{6}$

(d) No, $\frac{1}{0}$ is undefined.

13. $\frac{8}{7}$

14. $\frac{6}{5}$

15. $\frac{9}{10}$

$\frac{5}{14}$

17. $\frac{1}{4}$

!2$!7 $ 14

8. − − = — = 1

7 2 14

9. $\left(-\frac{9}{5}\right)\left(-\frac{5}{9}\right) = \frac{45}{45} = 1$

18. $\frac{1}{9}$

19. No reciprocal exists.

No reciprocal exists.

multiplying

multiplying

37.

40.

99 921 1

÷ = ÷ =

102 109 5

2 2

2 1

30 15 30 8 2

5 1

3 3 3 4

4 12 4 4 3

12 1 6665 30

5 5 5 6 30 1

40 8 40 15 5

5 1

10

9 13 9 90

100 1000 100 13 13

1

46. $\frac{1000}{17} \div \frac{10}{3} = \frac{1000}{17} \cdot \frac{3}{10} = \frac{300}{17}$

49. $\frac{7}{8} \div \frac{1}{4} = \frac{7}{8} \cdot \frac{4}{1} = \frac{7}{2}$

50. $12 \div 3 = 12 \cdot 5 = 20$

53. $6 \cdot \frac{3}{4} = \frac{1}{1} \cdot \frac{3}{4} = 8$

56. $\frac{42}{11} \div 7 = \frac{42}{11} \cdot \frac{1}{7} = \frac{6}{11}$

57. $\frac{16}{3} \div \frac{2}{5} = \frac{8}{3} \cdot \frac{5}{2} = \frac{40}{3}$

61. $\frac{22}{7} \cdot \frac{5}{16} = \frac{11}{7} \cdot \frac{5}{8} = \frac{55}{56}$

62. $\frac{21}{40} \cdot \frac{25}{18} = \frac{7}{8} \cdot \frac{5}{6} = \frac{35}{48}$

63. $8 \div \frac{3}{16} = \frac{8}{1} \cdot \frac{16}{3} = 42\frac{2}{3}$

64. $5 \div \frac{4}{15} = \frac{5}{1} \cdot \frac{15}{4} = 18\frac{3}{4}$

65. $3\frac{2}{3} \cdot 6$ multiplies $3\frac{2}{3}$ by

55. $\frac{16}{5585} \quad \frac{16}{7} \quad \frac{1}{1} \quad \frac{2}{=}$

$\frac{6}{1}$, and $\frac{2}{3} \div 6$ multiplies $\frac{2}{3}$ by $\frac{1}{6}$. So $\frac{2}{3} ! 6 = \frac{2}{3} ! \frac{6}{1} = 4$

$\frac{1}{2} \quad \frac{2}{1} \quad \frac{1}{1} \quad \frac{1}{1}$

3 3 6 9

1

and ÷6= ⁄! = .

2 2 2

66. 8! 3 multiplies 8 by 3 , and 8 ÷ 3

8

multiplies 8 by 3 . So 8 ! 2 = 8 ! 2 = 16

2 31 3 3

4 7

2 8 3

and 8 ÷3 = 1 ! 2 = 12.2

1

2
7 1

67. 54 ÷ 2 54 3 27 ÷9

2

1 3 21 2 7

7 1

3
= 27 ! 1 = 3
7 9 7
1

68. 48 3 ÷ ÷8= 16 48 8 1 ! ÷8= 16 ÷8

56 8 56 3 7

7 1

2

1
6 [redacted]

1 2 7

7

5

= ! = .

1 7 8 7

2

1

69. 3 6 5 3 7 5 7 5 7 1

5 ÷7!3 = 5! 6 3 = 10 !3=6

72. 7 ÷ 1 $ = ÷ 1 , 1 $ = 7 1 ÷

2 8 2 2 8 4

1

4 7

= 8 1 = 2

73. !2 ÷ 8$ 2 1 = ! 2 3 $ 2 =!3$2= 3 '3

5 3 5 8 20 20 20

4

= 9
400

74. ! 5 ÷ 2$ 2 = ! 1 2 5' 3 $ = ! 5 2 $ = , 5

& # &

12 3 1 2 2% "8% 8 8

4

= 25

64

1 2

!63 9 $2 ! 63 4 $! 7 $ 2

÷ '4=# ' 9 & '4= ' 4

8 4 " 8 % 2

1

1

= 7 7 4 = 49 4 = 49

2
1

1

2 2

2 1

2 1 4 1

5 35 1 5 16 1 2 1 1

70. ÷ ! = ! ! = ! = —

8 16 4 8 35 4 7 4 14

5

1 3
2 2

! 25 50$ 2 ! 5 9 $! 3$

76. — ÷ '8=# ' &'8= ' 8

1 7 2 3 9 " 30 2

1 2 % 2

! 3$ 9339 9 9 2

71. 8 14 88 14 64 14 = 3/2 · 3 · 8/21 = 9/4 · 8/1 = 18

$$= \frac{9}{64} \cdot \frac{14}{9} \div \frac{9}{32} \cdot \frac{2}{9} \cdot \frac{7}{7} = \frac{1}{32}$$

77.

81. Li wrapped 54 packages.

She can sell 80 parcels of land.

$$\frac{3}{} \quad \frac{1}{} \quad \frac{3}{} \quad \frac{8}{16} \qquad 1$$

85. $16 \div \frac{3}{4} = \frac{\cancel{16}^{4}}{1} \times \frac{3}{\cancel{4}_{1}} = 12$

The stack will be 12 in. high.

$24 \div \frac{4}{5} = \frac{\cancel{24}^{6}}{1} \times \frac{5}{\cancel{4}_{1}} = 30$

Yes, the books will take up only 30 in.

87. (a) $18 \div \frac{2}{3} = \frac{\cancel{18}^{9}}{1} \times \frac{3}{\cancel{2}_{1}} = 27$

27 commercials in 1 hr

27×24=648

648 commercials in 1 day

Ä Ā

0 2

(a) $20 \div 2 = 1 \times 1 = 40$

40 commercials in 1 hr

40×24=960

960 commercials in 1 day

$\frac{1}{}$ 1 240,000

89. (a) $10 \times 240,000 = 10 \times \frac{240,000}{10}$

$= 24,000$

The down payment is \$24,000.

$\frac{2}{3} \times 24,000 =$

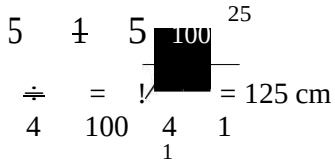
1

Ricardo's mother will pay \$16,000.

\$24,000 − \$16,000 = \$8000
Ricardo will have to pay \$8000.

= 24 cups of juice

(c) 0,000 − $24,000 = $216,000 He will have to finance $216,000.
$24



90. (a) $\frac{1}{12}\cdot 18{,}000 = \frac{1}{12}\cdot\frac{18{,}000}{1}$

$$= \frac{18{,}000}{12}$$
$$= 1500$$

The down payment is \$1500.

$$\frac{1}{2}\cdot 1500 = \frac{1}{2}\cdot\frac{1500}{1} = 750$$

Althea's parents will pay \$750.

\$1500 − \$750 = \$750
Althea will have to pay \$750.

(c) \$18,000 − \$1500 = \$16,500

She will have to finance \$16,500.

(a) $3\cdot\frac{9}{4} = \frac{3}{4}$

$\frac{3}{4}$

She plans to sell $\frac{3}{4}$ acre.

$\frac{2}{3}$

She keeps $\frac{2}{3}$ of the land.

$\frac{2}{3}\cdot\frac{9}{4} = \frac{3}{2}$ or $1\frac{1}{2}$ acres

92. (a) $\frac{1}{6}\cdot(24+18) = \frac{1}{6}\cdot(42) = \frac{1}{6}\cdot\frac{42}{1} = 7$

Josh has read 7 pages.

(24+18)−7=42−7=35 He still must read 35 pages.

93. $7\div\frac{1}{4} = \frac{7}{1}\cdot\frac{8}{1} = 14$

She can prepare 14 samples.

94. $8\div 16 = 8\cdot\frac{1}{16} = \frac{1}{2}$

Tony must make 14 strikes.

The length is 12 ft, because

$$30\div\frac{5}{2} = 30\cdot\frac{2}{5} = \frac{60}{5} = 12$$

$\frac{4}{7}$

The width is $\frac{4}{7}$ m, because

$$8\cdot\frac{1}{14} = \frac{8}{14} = \frac{4}{7}$$

Problem Recognition Exercises: Multiplication and Division of Fractions

1. (a) $\frac{8}{5}\cdot 6 = \frac{8}{5}\cdot\frac{3}{1}\cdot\frac{2}{1} = \frac{16}{5}$

(b) $6\cdot\frac{8}{5} = \frac{3}{1}\cdot\frac{2}{1}\cdot\frac{8}{5} = \frac{16}{5}$

(c) $\frac{3}{5}\cdot\frac{5}{3}\cdot\frac{6}{3} = \frac{3}{5}\cdot\frac{5}{3}\cdot\frac{2}{1}\cdot\frac{3}{3} = \frac{2}{3}$

(d)

2. (a) $10\cdot\frac{12}{7} = \frac{10}{1}\cdot\frac{3}{7} = \frac{40}{7}$

(b) $\frac{12}{7}\cdot 10 = \frac{3}{7}\cdot\frac{4}{1}\cdot\frac{10}{1} = \frac{40}{7}$

(c) $\frac{10}{7}\div\frac{12}{7} = \frac{10}{7}\cdot\frac{7}{12} = \frac{5}{6}\cdot\frac{7}{3} = \frac{35}{18}$

$\frac{6}{} \div 8 = 6!3 = 2!3! \quad 3 = 9$

(d)

$12 \div 10 = 12 ! 3 = \frac{}{} \frac{2!}{6!} 3 = 18$

5 3 5 8 5 2!4 20 7 3 7 10 7 2!5 35

3. (a) 12!9 =12!9 3!4! 9 =27

8 1 8 1 2 ! 4 2

9

(b) !12= 9 !12 9 !3!4 =27

8 8 1 2 ! 4 1 2

(c) 12 ÷9 =12!8 =3 ! 4 ! 8 =32

8 1 9 1 3 ! 3 3

9

(d) ÷12= 9 ! 1 = 3 ! 3 1 =3

8 8 12 8 3 ! 4 32

3 15 3 3!5 3 9

(a) 15 ! = ! = ! = =9

5 1 5 1 5 1

3 3 15 3 3 ! 5 9

(b) 5 !15= 5 ! 1 = 5 ! 1 = 1 =9

3 155 3!5 5 25

15÷ = ! = ! = =25

5 1 3 1 3 1

3 3 1 3 1 1

(d) ÷15= ! = ! =

5 5 15 5 3 ! 5 25

5 5 25

6 ! =

5. (a) 6 36

5 6 1

! = =1

6 5 1

5 5 5 6 1

÷ = ! = =1

6 6 6 5 1

565525

÷ = ! =

7. (a) 1 ! 2 !16 = 1 ! 2 ! 4 ! 4 = 8

12 3 21 3! 4 3 21 189

1 2 16 1 2 21

(b) 12 ! 3 ÷21 = 12 ! 3 ! 16

1 2 3! 7 7

=

= 12 ! 3 2 ! 8 96

(c) 1 ÷2!16= 1 ! 3 ! 4!2!2

12 3 21 3 ! 4 2 21

2

21

1 ÷2 ÷16= 1 !3!21

12 3 21 12 216

= 1 !3!21=21

3!4 2 16 128

1 7 2 7

! ! =

9

8. (a) 2

3

27

17 2 17 3 1 7 3 7

!÷=!!=! ! =

29 3 292 2 3!3 2 12

1÷7!2=1!9!2= 1! 3!3! 2 = 3

2 9 3 27 3 2 7 3 7

17219327

÷ ÷=!!=

29327228

1 9 61

9. (a) 10 ! 6 ! 4 = 10 ! 1 ! 4

=9!2!3! 1 =27

10 1 2!2 20

6 5 6 6 36

$\frac{9}{.}$

6. (a) 8 !0=0

$$0!\frac{9}{8}=0$$

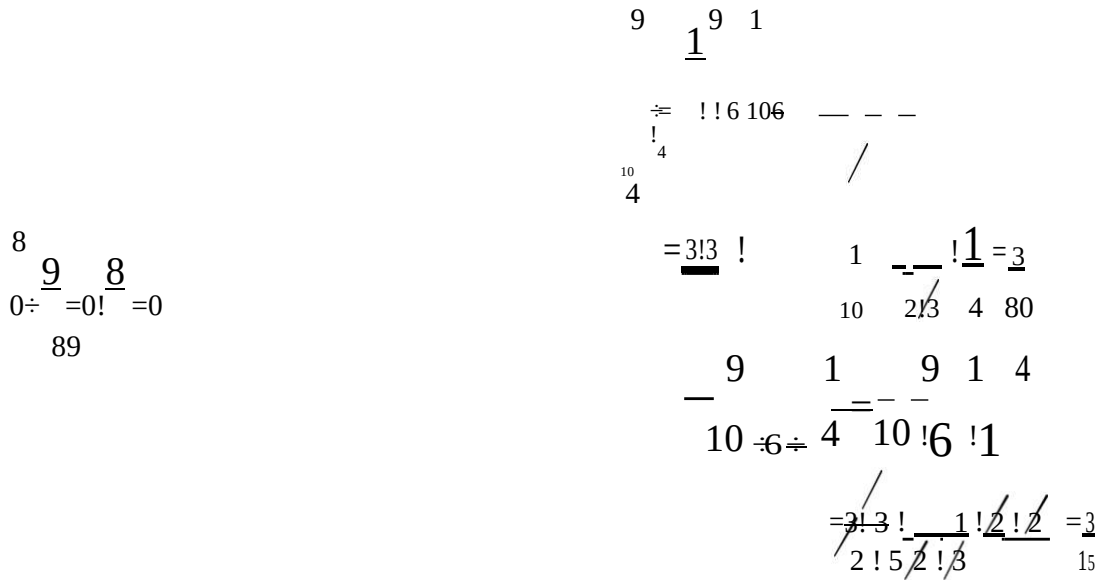
$$10!6\div\frac{1964}{10!1!1}$$

$$=9!2!3!4=108$$

2 ! 5 1 1 5

(c) $\frac{9}{-}\div 0$ = Undefined

(c)



10. (a) $4 \cdot \frac{1}{5} \cdot 10 = \frac{4}{5} \cdot \frac{1}{5} \cdot \frac{10}{1} = \frac{2}{5}$

$\frac{4}{5} \cdot 20 \qquad \frac{4}{5} \cdot \frac{2}{1} \cdot \frac{10}{1} \qquad 5$

$4 \cdot \frac{1}{5} \div 10 = \frac{4}{5} \cdot \frac{1}{10} = \frac{4}{50}$

$5 \cdot 20 \qquad 5 \qquad 4 \cdot 5 \qquad 250$

$4 \cdot \frac{1}{5} \div 10 = \frac{4 \cdot 20}{5} \cdot \frac{2 \cdot 5}{1} = \frac{160}{1}$

$5 \cdot 20 \qquad 5 \cdot 1 \qquad 1 \qquad 1$

$= 160$

(d) $\frac{4}{5} \div \frac{1}{20} \div 10 = \frac{4}{5} \cdot \frac{20}{1} \cdot \frac{1}{10}$

$5 \cdot 20 \qquad 5 \cdot 1 \cdot 10$

$= \frac{2 \cdot 2}{5} \cdot \frac{4 \cdot 5}{1} \cdot \frac{1}{2 \cdot 5} = \frac{8}{5}$

$\frac{2}{5} \qquad \frac{2}{5}$

11. (a) $3 \cdot 1 = \frac{3}{2} \qquad 2 \qquad 2$

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

$\div 1 = \frac{2}{3} \qquad \frac{2}{3}$

$1 \div = 1 \cdot \frac{3}{2} = \frac{3}{2}$

$3 \qquad 2 \qquad 2$

12. (a) $6 \div 10 = \frac{6}{1} \cdot \frac{1}{10} = \frac{2 \cdot 3}{1} \cdot \frac{1}{2 \cdot 5} = \frac{3}{5}$

$1 \quad 10 \qquad 1 \qquad 2 \cdot 5 \qquad 5$

$\frac{10}{1} \cdot \frac{1}{6} \cdot \frac{2 \cdot 5}{1} \cdot \frac{1}{5}$

(b) $10 \div 6 = 1 \cdot 6 = 1 \cdot 2 \cdot 3 = 3$

(c) $6 \cdot 10 = 60$

14. (a) $\frac{1}{7} \div 2 = \frac{1}{7} \cdot \frac{1}{2} = \frac{1}{14}$

$\frac{1}{7} \cdot \frac{1}{2} = \frac{1}{14}$

$\frac{1}{7} \cdot 2 = \frac{1}{14}$

$\frac{1}{7} \div 2 = \frac{1}{7} \cdot \frac{1}{2} = \frac{1}{14}$

(a) $4 \cdot \frac{1}{6} = 4 \cdot 4 \cdot \frac{1}{6} = 16 \cdot \frac{1}{6} = \frac{2 \cdot 8}{6} \cdot \frac{1}{1} = \frac{8}{3}$

$2 \cdot \frac{1}{6} \qquad \frac{1}{6} \qquad 1 \qquad 2 \cdot 3$

$4 \div \frac{1}{6} = 4 \cdot 4 \div \frac{1}{6} = 16 \cdot \frac{1}{6} = 16 \cdot 6 = 96$

$6 \qquad 6 \qquad 1$

(c) $4 \cdot \frac{1}{6}^2 = \frac{4}{1} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{4}{36} = \frac{4}{4 \cdot 9} = \frac{1}{9}$

(d) $4 \div \frac{1}{6}^2 = \frac{4}{1} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{4}{1} \div \frac{1}{36}$

$4 \cdot 36 = \frac{144}{1} = 144$

$1 \cdot \frac{2}{3} \qquad \frac{2}{3} \qquad 1 \qquad 1 \cdot \frac{2}{3} \qquad 1$

16. (a) $2^2 \cdot 3 = 2 \cdot 2 \cdot 3 = 6$

(d) 10!6 = 60

13. (a) $8 \div \frac{1}{4} = 8 ! 4 = 32$

(b) $8 ! = \frac{2}{4} = \frac{}{4}$

(b) $! \frac{1}{} \$ \div \frac{2}{} = \frac{1}{} , \frac{1}{} \frac{3}{} = \frac{3}{}$

$\frac{2}{} \quad 3 \quad 2\ 2 \quad 2 \quad 8$

$\frac{1}{} ! \frac{2}{} \% = 1 ! ! = \frac{2}{}$

$2 \quad 3 \qquad 2 \quad 3\ 3 \quad 9$

$\frac{1}{} ! \frac{2}{} \$ \frac{1}{} ! 2\ 2 \quad \$1\ 4$

(d) $2 \div 3 = 2 \div 3\% = 2 \div \frac{3}{100} = 2 \div \frac{1}{33} = 2 \times 33 = 66$

(c) $8 \div 4 = 2$

(d) $8 ! 4 = 32$

$= \frac{1}{2} ' \frac{9}{4} = \frac{9}{8}$

Section 2.6 Multiplication and Division of Mixed Numbers

Section 2.6 Practice Exercises

Chapter Review Exercises, pages 157−160
Chapter Test, pages 160−161 Cumulative Review Exercises,
pages 161−162
Answers will vary.

1 4 = 1!7+4 = 11
7 7 7

12. 4 1 = 4!8+1 = 33
8 8 8

13. 6 77 R 5 = 12 5/6
!6
17
!12
5

3. 13 ! 10 = 26
5 9 9

20 10 3 2
9 ÷ 3 = 9 ! 10 = 3
3 1

42 7 42 2 12
= ! =
11 2 11 7 11

32 32 1 8
÷4= ! =
15 15 4 15

52 52 1 4 2
÷13= ! = =
18 18 13 18 9

14. 11 57 R 2
!55
2

15. 4 39 R 3
!36
3

16. 2 31 R 1
!2
11
!10
1

17. # 2 $ # 3 & $ = ' =
% 5 & % 12 5 12 5

1. Multiply the whole number by the denominator.
2. Add the result to the numerator.
3. Write the result from step 2 over the denominator.

5   37   =7 $\frac{2}{5}$

!35

2

5

3!5

2= 5 5

2 =17

$2\frac{7}{10} = \frac{2!10+7}{10} = \frac{27}{10}$

13 3 9
! 1"! 3 " 26 15 39
18. #5 $ # 3 $ = ' = !8 2$! 2 1$ = 26 ' 27 = 18
% 5 & % 4 & 5 4 2 3 13 3 13
1 2 1 1

19
2) 39 = 19 1
!2 2
19
!18
1

5
! 1$ 29 10 145
7 '10 = =
4 4 1 2
2

1
1 5 7 5 5
19. 2 3! 7 = 3! 7 = 3
1

72
2) 145 = 72 1
!14 2
5
!4
1

1
3) 5 = 1 2
!3 3
2

!2" 8 3 1
2 #3= # [redacted] =8
$3%
& 3 , 3 1
1

1
1 4 49 4 7
6 ! = ! =
8 7 8 7 2
2 1

5
4 8!0=0

3
2) 7 = 3 1
!6 2
1

1
28. 0!6 10 = 0

1
38 9
49!9= 9 ! 1 =38
1

1 1
$ 1
!3 1 !2 1$ = 7 ' 15 = 15 = 7
2 7 2 7 2 2
1

2
10 6
3 3!6= 3 ! 1 =20
1

1
! 3 $! 1 $ 13 5 13 5
30. 1 1 = ' = = 1
10 4% 10 4 8 8
2

1
! 3 $! 1 $ 83 16 83
23. 5 5 = ' =
1

1
! 2 2 4 27 2 9 54 4
16 3 16 3 3
1

31. 5 $! $! $

1
=

&# &# & ' =
= 2
" 5%"9%" 5%
59525 25

1

$3\overline{)83} = 27\frac{2}{3}$

-6

23

-2

32. $6\frac{2}{8} \div 4\frac{7}{8} = \frac{49}{8} \div \frac{39}{8} = \frac{49}{8} \cdot \frac{8}{39} = \frac{49}{39} = 1\frac{10}{39}$

33. $1\frac{3}{5} \div 2\frac{1}{10} = \frac{8}{5} \div \frac{21}{10} = \frac{8}{5} \cdot \frac{10}{21} = \frac{16}{21}$

35. $5\frac{1}{9} \div 1\frac{3}{4} = \frac{46}{9} \div \frac{7}{4} = \frac{46}{9} \cdot \frac{4}{7} = \frac{184}{63} = 2\frac{58}{63}$

36. $12\frac{5}{13} \div 2\frac{5}{13} = \frac{161}{13} \div \frac{31}{13} = \frac{161}{13} \cdot \frac{13}{31} = \frac{161}{31} = 5\frac{6}{31}$

37. $2\frac{1}{16} \div 1\frac{1}{2} = \frac{33}{16} \div \frac{3}{2} = \frac{33}{16} \cdot \frac{2}{3} = \frac{11}{8} = 1\frac{3}{8}$

38. $7\frac{5}{12} \div 1\frac{5}{12} = \frac{89}{12} \div \frac{17}{12} = \frac{89}{12} \cdot \frac{12}{17} = \frac{89}{17} = 5\frac{4}{17}$

39. $4\frac{2}{3} \div 2\frac{4}{9} = \frac{14}{3} \div \frac{22}{9} = \frac{14}{3} \cdot \frac{9}{22} = \frac{21}{11} = 1\frac{10}{11}$

40. $5\frac{2}{3} \div 2\frac{1}{6} = \frac{17}{3} \div \frac{13}{6} = \frac{17}{3} \cdot \frac{6}{13} = \frac{34}{13} = 2\frac{8}{13}$

44. $6\frac{1}{2} \div 2\frac{1}{2} = \frac{13}{2} \div \frac{5}{2} = \frac{13}{2} \cdot \frac{2}{5} = \frac{13}{5} = 2\frac{3}{5}$

46. $2\frac{7}{13} \div 5\frac{1}{7} = \frac{33}{13} \div \frac{36}{7} = \frac{33}{13} \cdot \frac{7}{36} = \frac{77}{156}$

$1\frac{1}{2} \div 3\frac{1}{7} = \frac{3}{2} \div \frac{22}{7} = \frac{3}{2} \cdot \frac{7}{22} = \frac{21}{44}$

$2\frac{1}{2} \div 1\frac{1}{2} = \frac{5}{2} \div \frac{3}{2} = \frac{5}{2} \cdot \frac{2}{3} = \frac{10}{6} = 1\frac{4}{6}$

$4\frac{2}{3} \div 3\frac{1}{3} = \frac{14}{3} \div \frac{10}{3} = \frac{14}{3} \cdot \frac{3}{10} = \frac{14}{10} = 1\frac{4}{10}$

$3\frac{19}{44} \div 8\frac{1}{4} = \frac{151}{44} \div \frac{33}{4} = \frac{151}{44} \cdot \frac{4}{33} = \frac{151}{363}$

Tabitha earned $38.

$7\frac{2}{3} \times 8\frac{3500}{10{,}500}$

2 !10,500 = ! =
28,000
3 3 1

1

The land will cost Kurt
$28,000.

5

51. 25 !25 = ! = =
642
10 10 1 2 2

2

1
Average Americans consume 642 2
lb.

5
21

42. $0 \div 1\frac{1}{11} = 0$

43. $2\frac{5}{6} \div 6 = \frac{17}{6} \div 6 = \frac{17}{6} \cdot \frac{1}{6} = \frac{17}{36}$

52. $6\frac{3}{4} \div 15 = \frac{27}{4} \div \frac{15}{1} = \frac{27}{4} \cdot \frac{1}{15} = \frac{9}{4} \cdot \frac{1}{5} = \frac{9}{20}$

$2 \quad 3 \quad 20 \quad 63 \quad 105$

$1 \quad 1$

Kayla is paid $105.

(a) $4\frac{1}{4} \div 4 = \frac{17}{4} \div \frac{4}{1} = 4\frac{1}{4}$ weeks old

$$2\frac{1}{8} \div 4 = \frac{17}{8} \div \frac{4}{1}$$

$$= \frac{17}{8} \cdot \frac{1}{4} = \frac{17}{32} = 8\frac{1}{2} \text{ weeks old}$$

$$1\frac{1}{4} \div 3 = \frac{5}{4} \div \frac{3}{1} = \frac{5}{4} \cdot \frac{1}{3} = \frac{5}{12}$$

Each child will inherit $\frac{5}{12}$ million.

$$28\frac{1}{2} \div 1\frac{17}{24} = \frac{57}{2} \div \frac{41}{24} = \frac{57}{2} \cdot \frac{24}{41} = \frac{684}{41}$$

$$= 16\frac{28}{41}$$

The roll is $16\frac{28}{41}$ ft long.

(a) Lucy: $35\frac{1}{2} \cdot 14 = \frac{71}{2} \cdot \frac{14}{1} = 497$

Ricky: $42\frac{1}{2} \cdot 10 = \frac{85}{2} \cdot \frac{10}{1} = 425$

$497 - 425 = 72$

Lucy earned $72 more than Ricky.

$497 + 425 = 922$

Together they earned $922.

59. $6 \div 1\frac{8}{9} = \frac{6}{1} \div \frac{17}{9} = \frac{6}{1} \cdot \frac{9}{17} = \frac{54}{17} = 3\frac{3}{17}$

60. $8 \div 2\frac{1}{3} = 8 \div \frac{7}{3} = \frac{8}{1} \cdot \frac{3}{7} = \frac{24}{7} = 3\frac{3}{7}$

61. $1\frac{2}{3} \div \frac{5}{10} = \frac{5}{3} \cdot \frac{10}{5} = \frac{10}{3} = 3\frac{1}{3}$

62. $3\frac{5}{8} \div 3\frac{1}{2} = \frac{29}{8} \div \frac{7}{2} = \frac{29}{8} \cdot \frac{2}{7} = \frac{29}{28} = 1\frac{1}{28}$

64. $5\frac{3}{16} \div 3\frac{1}{2} = \frac{83}{16} \div \frac{7}{2} = \frac{83}{16} \cdot \frac{2}{7} = \frac{83}{56} = 1\frac{27}{56}$

$$2\frac{19}{21} \div 1\frac{7}{10} = \frac{61}{21} \div \frac{17}{10} = \frac{61}{21} \cdot \frac{10}{17} = \frac{610}{357} = 1\frac{253}{357}$$

$$2\frac{8}{17} \div 2\frac{34}{51} = \frac{42}{17} \div \frac{136}{51} = \frac{42}{17} \cdot \frac{51}{136} = \frac{2142}{2312} = \frac{63}{68}$$

$$2 \div 1\frac{1}{2} = \frac{2}{1} \div \frac{3}{2} = \frac{2}{1} \cdot \frac{2}{3} = \frac{4}{3} = 1\frac{1}{3}$$

66. !1 = !
=

7 9 7 9 63

2

67. 0 9 3 =0

3 1 3 5 3 2 3

8 2 8 2 8 5 20

4

3

1121

3 1

69. 12! = !
= =1

$$\frac{3}{} \quad \frac{5}{} \quad \frac{\cancel{15}^{5}}{} \quad 11 \quad \frac{55}{} \quad \frac{7}{}$$

58. $3^{4} \quad !16 = 4!\,\frac{\cancel{6}^{2}}{} \quad = 8 = 6^{8}$

$$8 \quad \frac{\cancel{}}{1} \quad \frac{\cancel{8}^{2}}{} \quad 2 \quad 2$$

$$20! = \frac{\cancel{20}^{4}}{15} ! \frac{\cancel{2}}{1} = \frac{\cancel{15}^{3}}{3} = \frac{\cancel{2}}{3} \quad \frac{2}{3}$$

8
6 ÷0 is undefined.

9

1
0!2 =0
8

73. ! 2 $! 7 $! 3 $ 17 7 15 21
3

5 34 3 = '
4% 5 34 4=8

1 2
5

= 2 8

1 2
74. ! 1 $! 4 $! 14$ 31 11 14
5 =
1 &

6 " 7 33% ' '

= 6 7 33
1 3

62 = 31 = 3 4
18 9 9

1 1 1 57 4 9
75. 7 ÷1 ÷2 = ÷ ÷ –

8 3 4 8 3 4

19 1 1
57 3 4 19 3

8 ! 4 ! 9 = 8=28
Ä Ā

1

1 5 5 254021

3 ÷5 ÷1 = ÷ ÷
8 7 16 8 7 16

5 1 2
=25 1 7 ! 16 =10 = 5
8 40 21 24 12

1 1 129 43 3 129 1
2 2 2 2 2 2 1 !=3

78. 64 ÷21 = ÷ =

It takes 3 gallons of gas for Sara to get to and from work.
3×$5=$15
It costs Sara $15 each day.

2 1 1
12 !25 = 318

3 8 4

1 1 1
38 3÷12 2=315

–5 1 18

56 6 ÷36 =1719

– 11

255!18 2 = 4665

-7 1 99

3212 ÷12 6 = 2146

5404
– – Ā Ā Ā

1069 ÷416 =2753

1 3 1

1 8 3

The perimeter of the garden is
2(20) + 2(15) = 40 + 30 = 70 ft.

14
1 70 5 70 4

70÷1 4= 1÷ 4= 1! 5=56
1

11 !41 = 480
2 4 8

8
1
5

9 !28 =280
9327

56 bricks will be needed.
56 × $3 = $168
The total cost is $168.

Chapter 2 Review Exercises

Section 2.1

1. $\frac{1}{2}$

2. $\frac{4}{7}$

3. **(a)** $\frac{5}{3}$

(b) Improper

4. **(a)** $\frac{1}{6}$

(b) Proper

5. $\frac{7}{15}$

$\frac{23}{8}$ or $2\frac{7}{8}$

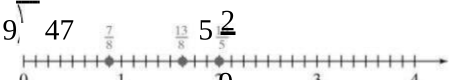
$\frac{7}{6}$ or $1\frac{1}{6}$

8. $6\frac{1}{7} = \frac{6 \cdot 7 + 1}{7} = \frac{43}{7}$

9. $11\frac{2}{5} = \frac{11 \cdot 5 + 2}{5} = \frac{57}{5}$

$4\frac{1}{4} \div \frac{1}{4} = \frac{17}{4} \div \frac{1}{4} = \frac{17}{4} \cdot \frac{4}{1} = 17$

11. 9) 47 = 5 $\frac{2}{9}$
!45
2



$\frac{232}{21} = 1\frac{1}{21}$

16. 7) 941 = 134
!7
24
!21
31
!28
3

$134\frac{3}{7}$

17. 26) 1582 = 60
!156
22
!0
22

$60\frac{22}{26} = 60\frac{11}{13}$

Section 2.2

21, 51, 1200

55, 140, 260, 1200

58, 124, 140, 260, 1200

Prime

Composite
44=4×11

Neither

Neither

2
2) 4
2) 8
2) 16
2) 32

13–15. 2) 64

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^6$

11
5) 55
3) 165

2 330

$2 \cdot 3 \cdot 5 \cdot 11 = 330$

$= 64$

27. 3 45 225 450 900

3 9

2 2 2

1, 2, 3, 4, 6, 8, 12, 16, 24, 48

1, 2, 4, 5, 8, 10, 16, 20, 40, 80

Section 2.3

3!9 ! 6!5
18"30

3 5
!
6 9

15!14 ! 21!10
210 = 210

15=10
21 14

32. 5/20 = 4!5 = 1/4

14 2!7 2

33. 49 = 7! 7 = 7

24 3!8 3
= = =

34. 16 2!8 2

35. 63= 9!7= 7
279!3 3

36. 17/17=1

37. 42/2121 = 2!21 =2

42 3 !14
45 = 3 !15 =
14

15 45−42=3
1

3/45 = 3/3!15 = 1/15
1

(a) 10 2!5 = !33=
6 2!32
= =
15 3!5 5

Section 2.4

3 2 6
!=
5 7 35

4 8 32
!=
3 3 9

9149

14! = ! =63
2 1 2
1

5 33 5

45. 33!11 = 1 ! 11 =15
1

1
1 1 4
2 3 36 1

46. 9!8!25=5
1 41 5
1
5 3 4
45 6 28 12

47. 7 ! ! 63= 7

38. 12
3!4 4 1 4 51 7
!1"
1 1

1 1 /

150 15 3!5 5

1

120 = = = 48. $ % = # # =

-

&10 ' 10 10 10 10 10, 000

39. $\frac{1400}{2000} = 20 = \sqrt{10} = 10$

2 2

!2" _! 1" - !22"!1 1"

\# \#

= 1 1 [redacted]

49. $%#$ % $ # % $ % !3600 = = 900

&5' &10' &5 5' &10 10'

4 4 1

1 1

4 1

= 25 # 100

25

There are 900 African American students.

300

1 2

40 yd

625

1 1

3 3

!3 2 " !1" = 1 1 1 1

50. $ # % = $ % # # =

& 20 3 ' &10' 10 10 10 1000

10 1

3 1

! 1 " ! 1000" 1 1000 1

=

51. # $ # $ ' =

%10& % 17 & 1000 17 17

1

52. $A = \frac{1}{2}bh$

53. $A = lw$

3

$A = \frac{1}{2}(12)$!17 " =6# 17 = 6 # 17 = 51 ft^2

2$ & 2 % ' 2 12

1

2

5 8 10 1

$A = lw =$ 4 ! 3 = 3 or 3 3 m

1

Ā Ā Ā Ā

20

$A =$!3+ ! !6

3 2 3

Ā Ā Ā Ā Ā Ā

0 2

20!3+1!20!6

3 1 2 3 1

1 1 1

20+20

$\frac{1}{12}\cdot 3600 = \frac{1}{12}\cdot\frac{3600}{1} = 300$

There are 300 Asian American students.

$\frac{1}{2}\cdot\frac{1}{6}\cdot 3600 = \frac{1}{2}\cdot\frac{1}{6}\cdot\frac{3600}{1} = \frac{3600}{12} = 300$

There are 300 Hispanic female students.

61. $\frac{1}{2}\cdot\frac{5}{12}\cdot 3600 = \frac{1}{2}\cdot\frac{5}{12}\cdot\frac{3600}{1} = \frac{1500}{2} = 750$

There are 750 Caucasian male students.

Section 2.5

$\frac{3}{4}\cdot\frac{4}{3} = 1$

$\frac{1}{12}\cdot 12 = \frac{1}{12}\cdot\frac{12}{1} = 1$

64. $\frac{2}{7}$

65. $\frac{1}{7}$

66. Reciprocal does not exist.

67. 6

57. $4\frac{7}{8} = \frac{4}{1}\cdot\frac{7}{8} = \frac{7}{2}$ or $3\frac{1}{2}$

Maximus requires $\frac{7}{2}$ or $3\frac{1}{2}$ yd of lumber.

$\frac{1}{5}$

Multiplying

$\frac{28}{15}\div\frac{21}{20}=\frac{28}{15}\cdot\frac{20}{21}=\frac{4\cdot7}{3\cdot5}\cdot\frac{4\cdot5}{3\cdot7}=\frac{16}{9}$

$7 \div 35 = 7 \cdot \frac{63}{35} = 7 \cdot \frac{7 \cdot 9}{5 \cdot 7} = 7 \cdot \frac{9}{5}$

$6 \div 18 = \frac{6}{7} \cdot \frac{1}{18} = \frac{1}{21}$

$\frac{39}{10} \div \frac{5}{10} = \frac{39}{10} \cdot \frac{10}{5} = \frac{39}{5} = 7\frac{4}{5}$

$200 \div 25 = 200 \cdot \frac{17}{51} = 25 \cdot \frac{8 \cdot 17}{51} = \frac{25 \cdot 8}{3} = \frac{200}{3}$

75. $12 \div \frac{6}{7} = \frac{12}{1} \cdot \frac{7}{6} = 14$

76. $3\frac{1}{8} \div 2\frac{19}{20} = \frac{25}{8} \div \frac{59}{20} = \frac{25}{8} \cdot \frac{20}{59} = \frac{125}{118} = 1\frac{7}{118}$

$\frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \frac{1}{64}$

77. $\left(\frac{12}{5}\right)^2 \div \frac{36}{25} = \frac{144}{25} \div \frac{36}{25} = \frac{144}{25} \cdot \frac{25}{36} = 4$

$\frac{36}{1} \cdot \frac{4}{5} = \frac{144}{5} = 28\frac{4}{5}$

$4 \div \frac{4}{5} = \frac{4}{1} \cdot \frac{5}{4} = 5$

$\frac{20}{5} = \frac{4}{1} = 4$

$18 \div \frac{3}{2} = \frac{18}{1} \cdot \frac{2}{3} = 12$

$\frac{24}{2} = 12$

82. $24 \div 3 = 8$

36 bags of candy

$4 \div \frac{5}{40} = \frac{4}{1} \cdot \frac{40}{5} = 32$ hr

$32 \times \$18 = \$576$

Amelia earned $576.

$\frac{44}{33} = \frac{16}{9} = 1\frac{7}{9}$

$\frac{10}{9} \cdot \frac{12}{1} = \frac{640}{9} = 71\frac{1}{9}$

The area is $\frac{640}{3}$ or $213\frac{1}{3}$ ft^2.

$9 \div \frac{8}{3} = \frac{9}{1} \cdot \frac{3}{8} = \frac{27}{8}$

Yes, he will have 24 pieces, which is more than enough for his class.

81 ÷ 3 = 3 81 ÷ 2 = 18

78. ÷ = ! ¡ =

Section 2.6

! 2"! 2" = 11 # 32 = 352

55 11 2 55 3 3 5

5 1 1

4 "1 %3 1

! 4 1 1

79. ÷2 = ! ÷2 = ÷2

13 2 13 8 26

1 1 2

= ! = 1

26 2 52

86. $3 %$6

3 5% 3 5 15

& '& '

23

15 352 7

!30 = 23 15

52

!45

7

! 1" ! 3" 1 34 71 71 2
#11 $ # $ = =23
% 3&% 34& 3 34 3 3
1

1 8
1 3 13 16

88. 6 2!113 = 2 !13 = 8

1 1

! 5 " 4 45 45 1

4# 5 =
89. $ % # = = 22
& 8 '
1 8 2 2
2

5

4513 !0 = 0

3 1
5 7 69 23 69 8 3 1
91. 4 ÷2 = ÷ = ! = = 1
16 8 16 8 16 23 2 2
2 1

2 5
19
92. 3 5÷34 =38 ÷ =38 ! =10
11 5 11 5 11 19 11
1

1
93. 7 ÷1 5 = 7 ÷ 14 = 7 ! 9 = 9 = 4 1
9 1 9 1 14 2 2
2

25
6 50 2 50 1 25 3
4 ÷2= ÷ = ! = =2
11 11 1 11 2 11 11
1
3

1 51 17 51 1 3
95. 10 ÷17 = ÷ = ! =
5 5 1 5 17 5

1

5
=0
0÷3 12
1 1 5 5 25 1
2 !1 = ! = =3
2 4 2 4 8 8

1
It will take 3 8 gal.

5 2
1 1 25 5 25 4
= ÷
98. 122÷1 4 2 4 = 2 ! 5=10
1 1

There will be 10 pieces.

Chapter 2 Test

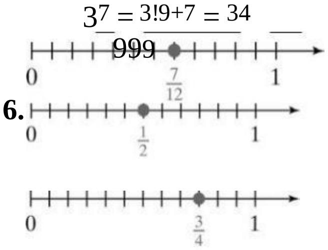
(a) 5/8
Proper

(a) 7/3
Improper

1
2; 5 2

3
5. (a) 12 44 3 12 8 = 3 3 2
!36
8

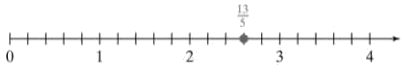
37 = 3!9+7 = 34
999

6.


$\frac{7}{7}$ is an improper fraction because the numerator is greater than or equal to the denominator.

7.

8.

9. 

10. (a) Composite 15= 3 × 5
Neither
Prime
Neither

Prime
(f) Composite 39= 3 × 13

(a) 1, 3, 5, 9, 15, 45

3
3)9
5)45

3!3!5 = 3^2 !5 = 45

(a) Add the digits of the number. If the

sum is divisible by 3, then the original number is divisible by 3.

Yes; 1 + 9 + 8 + 1 + 0 + 1 + 1 = 21 and 21 is divisible by 3.

(a) No; 1155 is not even.

Yes; 1 + 1 + 5 + 5 = 12 is divisible by 3.

Yes; the digit in the ones-place is a 5.
No; the digit in the ones-place is not 0.

15!4 ! 12!5
60=60

= 5/4

2!25!5 !

" 20

2/5 ! 4/25

150 = 5 ! 5 ! 2 ! 3 = 10 or 1 3
1055!3!777

1,200,[redacted] = 12 = 2 !6 = 6

Brad has the greater fractional part completed since 4/5 > 3/5.

19. 2/9 " 57/46 = 2/3 ! 3 . 3 !19 / 2 !23 = 19/69

1

20. !75 $ &'4= 24 % 75/24 ' 4/1 = 75/6 = 3 '25 / 3 ' 2
6

= 25/2 or 12 1/2

28/24 ÷ 21/8 = 28/24 ! 8/21

= 2!2!7 / 2!2!2!3 ! 2 !2!2 / 3!7 = 4/9

21

105/42 ÷ 5 = 105/42 ! 1/5 = 21/42 = 1/2

1

23. 2/18 " 25/9 " 40/6 = 2 / 2!3!3 ! 3! 3 / 5 ! 5 ! 2 !2!2! 5 / 2 ! 3

= 4/15

1

1200 600/65 ÷ 50/15 . 13/15 ÷ 1/2 = 1/2 ÷ 5 !10 / 5 — 13/!13 ÷ 15
1

1 3
= 1/10 ! 13 ! 15/13 = 3/4
2 2 1

1 1025

$21 \div 4\ 6 = 21 \div 6$

1,400, [redacted] 14 2 !7 7

15 3!5 3

$= \frac{10!6}{21\ 25}$

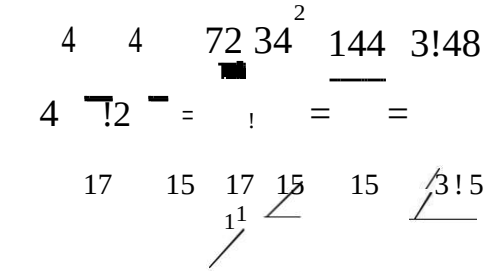
$\frac{2!5\ 2!3}{!} = \frac{3!7\ 5!5}{4} = 35$

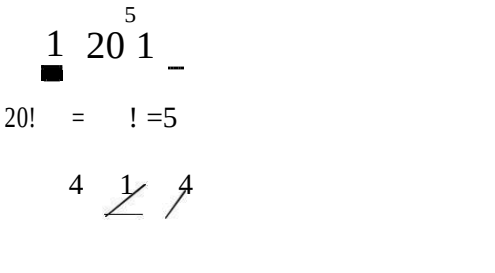
$25 = 5!5 = 5$

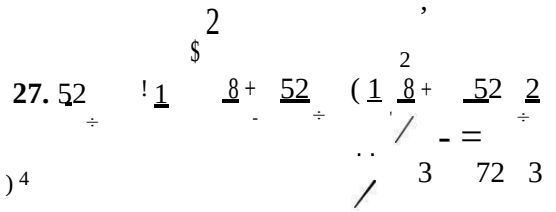
18. (a) Christine:

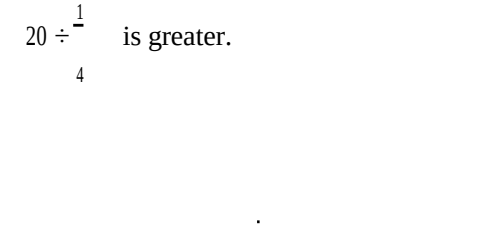
$16 = 4!4 = 4$

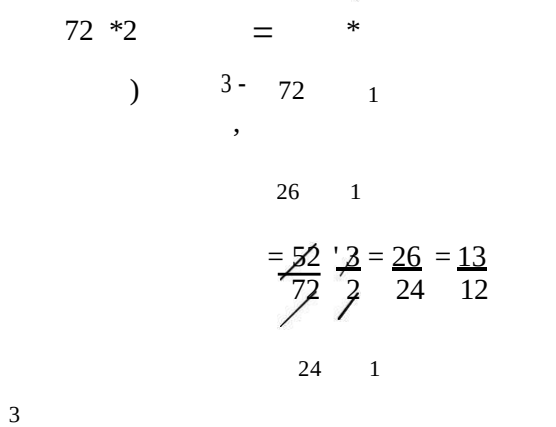
Brad: $\sqrt{20} = \sqrt{4}\,!\,5 = 5$

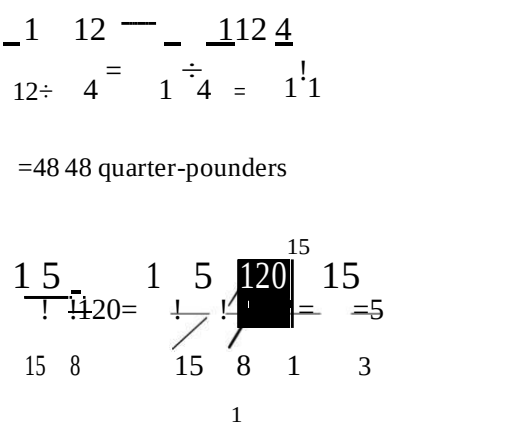


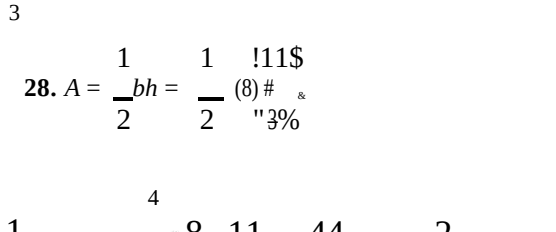


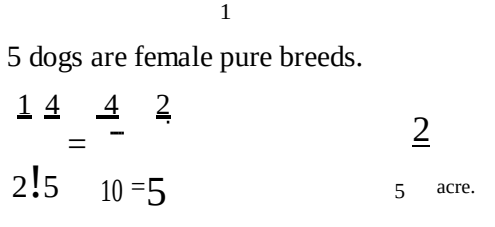


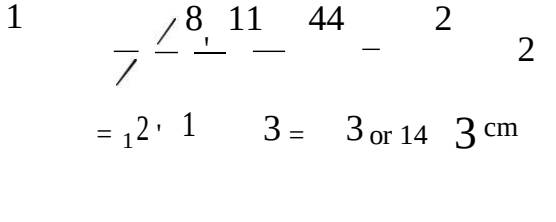


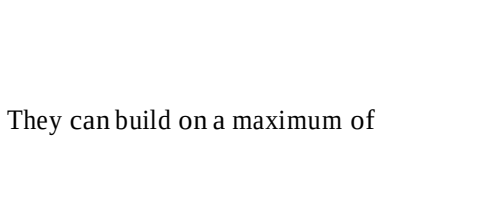


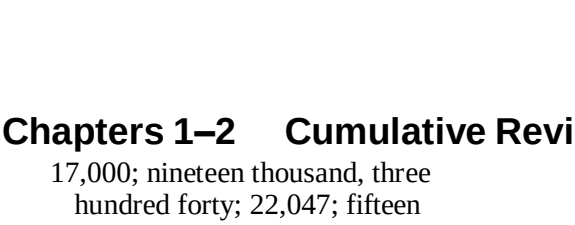


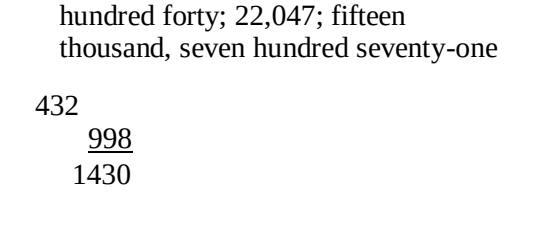


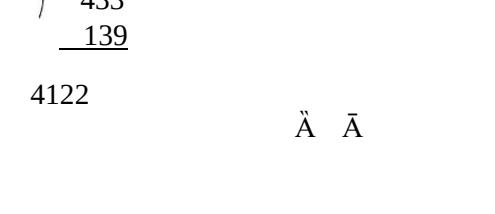






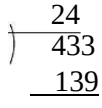






Chapters 1–2 Cumulative Review Exercises

17,000; nineteen thousand, three hundred forty; 22,047; fifteen thousand, seven hundred seventy-one



16 384
!32
64
!64
0

2
244
206 100
214,344

23
81
23
1840
1863

Ā Ā

18R2
4)74
!4
34

Ā

3,000,000
40,000
120,000,000,000

1007

823
184

48
8 =6

6+2·8=6+16=22

2 2
5 !3 =25!9=16

2 2

(5!3) =2 =4

c

b

e

a

19. (a) 4 / 7 7

(b) 7/3 or 2 1/3

20. (a) Proper
(b) Improper
(c) Improper

21. (a) 1, 2, [redacted], 6, 10, 15, 30

5
3)15
2)30
2·3·5=30

22. (a) 144 = 2!2!2!2!3!3 = 12 or 1 5

23. 35 ! 51 = 5 ! 7 ! 3 !17 = 119
27 95 3 !3!3 5 !19 171

2 4 17 34 17 5 5 (1)

24. 5 3 ÷ 6 5 = 3 ÷ 5 = 3 34 6 (2)

25. Yes; 8/13 ! 5/16 = 5/26 and 5/16 ! 8/13 = 5/26.

!12"5 1 5 5

26. Yes; $ # #% = # = and
[redacted]
& 2 9 ' 3 9 3 27
1

2 # 5 " = 1 # 10 = 5
$ %
2 & 9 3 ' 2 27 27

27. " 5 12 % 2 "2% 2 2 4 2
! ÷ = ÷ = ÷
$ ' '
#6 25& 3 5& 3253

= 2 4 ! 3 = 6
25 2 25

$A = lw =$ 11/5 ! 5/9 = 11/9 or 1 2/9 m²

84 2!2!3!7 7 7

60,000 = 6 =2!3 =2

150, [redacted] 15 5! 3 5

$A = \frac{1}{2}bh$

$= \frac{1}{2}(25)(8) = \frac{1}{2}(25)(2)(2)(2) = 50 \text{ ft}^2$

$\frac{1}{10} = \frac{4}{40}$

$\frac{3}{40}$ of the students are males from out of 40 stat e.

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