Solution Manual for Basic College Mathematics An Applied Approach Canadian 1st Edition by Aufmann Lockwood and Milburn

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Chapter 2: Fractions

Prep Test

20

120

9

10

7

$30\overline{)63}$ 2 r3

60

3

1, 2, 3, 4, 6, 12

8. 8·7 356 359

7

<

Multiples of 6: 6, 12,

18, 24, 30, 36, 42, 48,

54, 60

Multiples of 8: 8, 16, 24, 32, 40, 48, 56, 64,

Section 2.1

Concept Check

5, 10, 15, 20

7, 14, 21, 28

10, 20, 30, 40

15, 30, 45, 60

72, 80

Common multiples: 24, 48

Least common multiple: 24

1, 2, 3, 4, 6, 12

1, 2, 4, 5, 10, 20

1, 23

1, 2, 4, 7, 14, 28

Factors of 18: 1, 2, 3, 6, 9, 18

Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

Common factors: 1, 2, 3, 6

Greatest common factor: 6

Objective A Exercises

11.

$$\begin{array}{r|l|l} & 2 & 5 \\ 5 = & & \textcircled{5} \\ 8 = & \textcircled{2 \cdot 2 \cdot 2} & \end{array}$$

$\text{LCM} = 2 \cdot 2 \cdot 2 \cdot 5 = 40$

12.

$$\begin{array}{r|l|l} & 2 & 3 \\ 3 = & & 3 \\ 6 = & \textcircled{2} & \textcircled{3} \end{array}$$

$\text{LCM} = 2 \cdot 3 = 6$

13.

$$\begin{array}{r|l|l} & 2 & 3 \\ 3 = & & \textcircled{3} \\ 8 = & \textcircled{2 \cdot 2 \cdot 2} & \end{array}$$

$\text{LCM} = 2 \cdot 2 \cdot 2 \cdot 3 = 24$

14.

$$\begin{array}{r|l|l} & 2 & 5 \\ 2 = & \textcircled{2} & \\ 5 = & & \textcircled{5} \end{array}$$

$\text{LCM} = 2 \cdot 5 = 10$

15.

$$\begin{array}{r|l|l} & 2 & 3 \\ 4 = & \textcircled{2 \cdot 2} & \\ 6 = & 2 & \textcircled{3} \end{array}$$

$\text{LCM} = 2 \cdot 2 \cdot 3 = 12$

16.

$$\begin{array}{r|l|l} & 2 & 3 \\ 6 = & 2 & \textcircled{3} \\ 8 = & \textcircled{2 \cdot 2 \cdot 2} & \end{array}$$

$\text{LCM} = 2 \cdot 2 \cdot 2 \cdot 3 = 24$

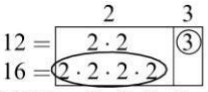
17.

$$\begin{array}{r|l|l} & 2 & 3 \\ 8 = & \textcircled{2 \cdot 2 \cdot 2} & \\ 12 = & 2 \cdot 2 & \textcircled{3} \end{array}$$

$\text{LCM} = 2 \cdot 2 \cdot 2 \cdot 3 = 24$

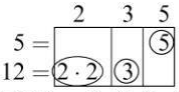
Chapter 2 Fractions 2-2

18.



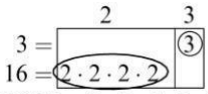
LCM $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 = 48$

19.



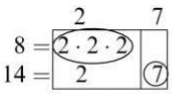
LCM $= 2 \cdot 2 \cdot 3 \cdot 5 = 60$

20.



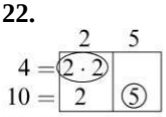
LCM $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 = 48$

21.



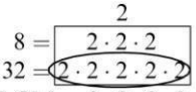
LCM $= 2 \cdot 2 \cdot 2 \cdot 7 = 56$

22.



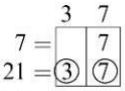
LCM $= 2 \cdot 2 \cdot 5 = 20$

23.



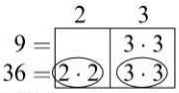
LCM $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$

24.



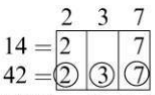
LCM $= 3 \cdot 7 = 21$

25.



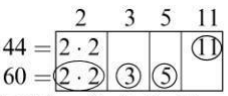
LCM $= 2 \cdot 2 \cdot 3 \cdot 3 = 36$

26.



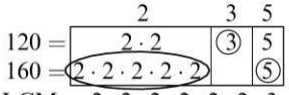
LCM $= 2 \cdot 3 \cdot 7 = 42$

27.



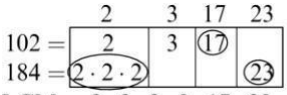
LCM $= 2 \cdot 3 \cdot 5 \cdot 11 = 660$

28.



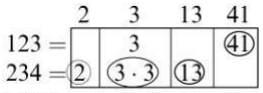
LCM $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 = 480$

29.



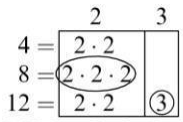
LCM $= 2 \cdot 2 \cdot 2 \cdot 3 \cdot 17 \cdot 23 = 9384$

30.



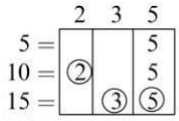
LCM $= 2 \cdot 3 \cdot 3 \cdot 13 \cdot 41 = 9594$

31.



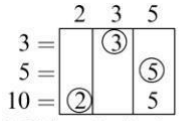
LCM $= 2 \cdot 2 \cdot 2 \cdot 3 = 24$

32.



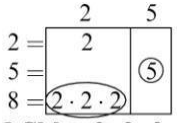
LCM $= 2 \cdot 3 \cdot 5 = 30$

33.



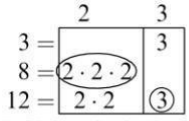
LCM $= 2 \cdot 3 \cdot 5 = 30$

34.



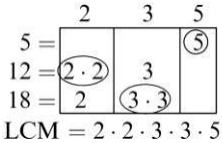
LCM $= 2 \cdot 2 \cdot 2 \cdot 5 = 40$

35.



LCM $= 2 \cdot 2 \cdot 2 \cdot 3 = 24$

36.



LCM $= 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 = 180$

Chapter 2 Fractions 2-3

18.

37.

	2	3
$9 =$		$3 \cdot 3$
$36 =$	$2 \cdot 2$	$3 \cdot 3$
$64 =$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$	

$\text{LCM} = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 = 576$

38.

	2	3	7
$18 =$	2	$3 \cdot 3$	
$54 =$	2	$3 \cdot 3 \cdot 3$	
$63 =$		$3 \cdot 3$	7

$\text{LCM} = 2 \cdot 3 \cdot 3 \cdot 3 \cdot 7 = 378$

39.

	2	3	5	7
$3 =$		3		
$7 =$				7
$20 =$	$2 \cdot 2$		5	

$\text{LCM} = 2 \cdot 2 \cdot 3 \cdot 5 \cdot 7 = 420$

40.

	2	3	5	7
$4 =$	$2 \cdot 2$			
$9 =$		$3 \cdot 3$		
$35 =$			5	7

$\text{LCM} = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 \cdot 7 = 1260$

True

False

Objective B Exercises

43.

	3	5
$3 =$	3	
$5 =$		5

$\text{GCF} = 1$

44.

	5	7
$5 =$	5	
$7 =$		7

$\text{GCF} = 1$

45.

	2	3
$6 =$	2	3
$9 =$		$3 \cdot 3$

$\text{GCF} = 3$

28.

46.

	2	3
$18 =$	2	$3 \cdot 3$
$24 =$	$2 \cdot 2 \cdot 2$	3

$\text{GCF} = 2 \cdot 3 = 6$

47.

	3	5
$15 =$	3	5
$25 =$		$5 \cdot 5$

$\text{GCF} = 5$

48.

	2	7
$14 =$	2	7
$49 =$		$7 \cdot 7$

$\text{GCF} = 7$

49.

	2	5
$25 =$		$5 \cdot 5$
$100 =$	$2 \cdot 2$	$5 \cdot 5$

$\text{GCF} = 5 \cdot 5 = 25$

50.

	2	5
$16 =$	$2 \cdot 2 \cdot 2 \cdot 2$	
$80 =$	$2 \cdot 2 \cdot 2 \cdot 2$	5

$\text{GCF} = 2 \cdot 2 \cdot 2 \cdot 2 = 16$

51.

	2	3	17
$32 =$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$		
$51 =$		3	17

$\text{GCF} = 1$

52.

	2	3	7	11
$21 =$		3	7	
$44 =$	$2 \cdot 2$			11

$\text{GCF} = 1$

53.

	2	3	5
$12 =$	$2 \cdot 2$	3	
$80 =$	$2 \cdot 2 \cdot 2 \cdot 2$		5

$\text{GCF} = 2 \cdot 2 = 4$

54.

	2	3
$8 =$	$2 \cdot 2 \cdot 2$	
$36 =$	$2 \cdot 2$	$3 \cdot 3$

$\text{GCF} = 2 \cdot 2 = 4$

55.

	2	5	7
$16 =$	$2 \cdot 2 \cdot 2 \cdot 2$		
$140 =$	$2 \cdot 2$	5	7

$\text{GCF} = 2 \cdot 2 = 4$

Chapter 2 Fractions 2-4

56.

	2	3
$48 =$	$2 \cdot 2 \cdot 2 \cdot 2$	$\textcircled{3}$
$144 =$	$\textcircled{2 \cdot 2 \cdot 2 \cdot 2}$	$3 \cdot 3$

$\text{GCF} = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 = 48$

57.

	2	3	11
$44 =$	$\textcircled{2 \cdot 2}$		11
$96 =$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$	3	

$\text{GCF} = 2 \cdot 2 = 4$

58.

	2	3
$18 =$	$\textcircled{2}$	$3 \cdot 3$
$32 =$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$	

$\text{GCF} = 2$

59.

	3	5	11
$3 =$	3		
$5 =$		5	
$11 =$			11

$\text{GCF} = 1$

60.

	2	3	5
$6 =$	2	3	
$8 =$	$2 \cdot 2 \cdot 2$		
$10 =$	$\textcircled{2}$		5

$\text{GCF} = 2$

61.

	2	7
$7 =$		7
$14 =$	2	$\textcircled{7}$
$49 =$		$7 \cdot 7$

$\text{GCF} = 7$

62.

	2	3	5
$6 =$	2	3	
$15 =$		$\textcircled{3}$	5
$36 =$	$2 \cdot 2$	$3 \cdot 3$	

$\text{GCF} = 3$

63.

	2	3	5
$10 =$	2		5
$15 =$		3	5
$20 =$	$2 \cdot 2$		$\textcircled{5}$

$\text{GCF} = 5$

64.

	2	3	5
$12 =$	$2 \cdot 2$	3	
$18 =$	$\textcircled{2}$	$3 \cdot 3$	
$20 =$	$2 \cdot 2$		5

$\text{GCF} = 2$

65.

	2	3	5
$24 =$	$2 \cdot 2 \cdot 2$	3	
$40 =$	$2 \cdot 2 \cdot 2$		5
$72 =$	$\textcircled{2 \cdot 2 \cdot 2}$	$3 \cdot 3$	

$\text{GCF} = 2 \cdot 2 \cdot 2 = 8$

66.

	3	17
$3 =$	3	
$17 =$		17
$51 =$	3	17

$\text{GCF} = 1$

67.

	3	17	31
$17 =$		17	
$31 =$			31
$81 =$	$3 \cdot 3 \cdot 3 \cdot 3$		

$\text{GCF} = 1$

68.

	2	3	7
$14 =$	2		7
$42 =$	$\textcircled{2}$	3	7
$84 =$	$2 \cdot 2$	3	$\textcircled{7}$

$\text{GCF} = 2 \cdot 7 = 14$

69.

	5
$25 =$	$\textcircled{5 \cdot 5}$
$125 =$	$5 \cdot 5 \cdot 5$
$625 =$	$5 \cdot 5 \cdot 5 \cdot 5$

$\text{GCF} = 25$

70.

	2	3	17	23
$12 =$	$2 \cdot 2$	3		
$68 =$	$2 \cdot 2$		17	
$92 =$	$\textcircled{2 \cdot 2}$			23

$\text{GCF} = 2 \cdot 2 = 4$

71.

	2	3	7
$32 =$	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$		
$56 =$	$2 \cdot 2 \cdot 2$		7
$72 =$	$\textcircled{2 \cdot 2 \cdot 2}$	$3 \cdot 3$	

$\text{GCF} = 2 \cdot 2 \cdot 2 = 8$

72.

	2	3
$24 =$	$2 \cdot 2 \cdot 2$	3
$36 =$	$\textcircled{2 \cdot 2}$	$3 \cdot 3$
$48 =$	$2 \cdot 2 \cdot 2 \cdot 2$	$\textcircled{3}$

$\text{GCF} = 2 \cdot 2 \cdot 3 = 12$

73. True

74. True

Chapter 2 Fractions 2-5

56. **Critical Thinking**

75. Joe has a 4-day cycle (3 workdays + 1 day off). Raya has a 6-day cycle (5 workdays + 1 day off). The least common multiple of 4 and 6 is 12. After Joe and Raya have a day off together, they will have another day off together in 12 days.

76. The LCM of 2 and 3 is 6. The LCM of 5 and 7 is 35. The LCM of 11 and 19 is 209. The LCM of two prime numbers is the product of the two numbers. The LCM of three prime numbers is the product of the three numbers.

77. The GCF of 3 and 5 is 1. The GCF of 7 and 11 is 1. The GCF of 29 and 43 is 1. Because two prime numbers do not have a common factor other than 1, the GCF of two prime numbers is 1. Because three prime numbers do not have a common factor other than 1, the GCF of three prime numbers is 1.

Projects or Group Activities

4, the GCF of 20, 36, and 60

79a. No; the GCF of 48 and 50 is 4. 48 and 50 are not coprime.

b. Yes; 25 5 5 and 36 2 2 3 3, so their GCF is 1.

c. Yes; 22 2 11 and 27 3 3 3, so their GCF is 1.

d. Yes; 71 and 73 are both prime numbers, so their GCF is 1.

65.

Section 2.2

Concept Check

Improper fraction; greater than 1

Mixed number; greater than 1

Proper fraction; less than 1

Improper fraction; equal to 1

Objective A Exercises

$4\frac{3}{}$

$7\frac{4}{}$

$8\frac{7}{}$

$5\frac{3}{}$

$1\frac{1}{}$

2

$2\ 3\frac{2}{}$

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

$2\ \frac{3}{}\ 4$

$\frac{3}{}\ 3\ \ 5$

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

$4\frac{5}{}$

$6\frac{7}{}$

Chapter 2 Fractions 2-6

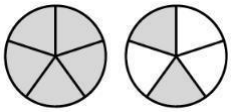
$\frac{8}{3}$

$9\frac{}{4}$

$\frac{27}{8}$

$\frac{18}{5}$

21.



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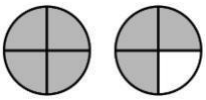

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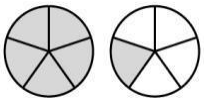


24.

False

Objective B Exercises

26. $2\ \frac{11}{4} = 2\frac{3}{4}$

$4\overline{)11}\quad 4\quad 4$

$\frac{8}{3}$

27. $5\ \frac{16}{5} = 5\frac{1}{5}$

29. $2\ \frac{18}{9} = 2$

$9\overline{)18}\quad 9$

$\frac{18}{0}$

30. $1\ \frac{9}{8} = 1\frac{1}{8}$

$8\overline{)9}\quad 8\quad 8$

1

$3\overline{)13}\ 3\frac{1}{4}$

$4\quad 4$

$\frac{12}{1}$

32. $\frac{23}{10} = 2\frac{3}{10}$

$10\overline{)23}$

$\frac{20}{3}$

33. $\frac{29}{2} = 14\frac{1}{2}$

$2\overline{)29}\quad 2\quad 14$

$\frac{2}{09}$

$\frac{8}{1}$

34. $\frac{48}{16} = 3$

$16\overline{)48}$

$\frac{48}{0}$

35. $\frac{51}{3} = 17$

$3\overline{)51}$

$\frac{3}{21}$

$\frac{21}{0}$

36. $-1\frac{8}{7} = -1\frac{1}{7}$

$8\quad 7\quad 7$

$\frac{7}{}$

Chapter 2 Fractions 2-7

3 16 3 3
15
1

28. 5 20 5
4 20 4
20
0

1

37. 1 16 = 1 7
9 16 9 9
9
7

38. 2 7 1

3 7 3 2 3
6
1

39. 1 9 4

[redacted]9 5 = 1 5
5
4

16 =16

40. 16 1
1 16
1
06
6

0

41. 23 23

1 23 1 = 23

2
03
3

0

42. 2 9 0
8 17
16
1

43. 1
16 31
16
15

44. 2
5 12
10
2

45. 6
3 19
18
1

1
9 9

47. 5 40

8 40 8 = 5
40
0

48. 9 72 9
8 72 8
72
0

49. 1 3 = 1

3 3 3
3
0

50. 2 1 6 1 7

3 3 3

51. 2 122 14

4 3 3 3

52. 1 121 13

6 2 2 2

2 1
88

16 31 = 1 16 15

12 5 2 2 5

19 3 = 6 3 1

9
9 1

$8\frac{2}{3}$

$6\frac{5}{6}$

$7\frac{3}{8}$

$9\frac{1}{4}$

$6\frac{1}{4}$

$10\frac{1}{2}$

$15\frac{1}{8}$

$8\frac{1}{9}$

61. $3\frac{5}{12}$ $\frac{365}{12}$ $\frac{41}{12}$

62. $5\frac{3}{11}$ $\frac{553}{11}$ $\frac{58}{11}$

63. $3\frac{7}{9}$ $\frac{277}{9}$ $\frac{34}{9}$

64. $2\frac{5}{8}$ $\frac{165}{8}$ $\frac{21}{8}$

65. $12\frac{2}{3}$ $\frac{362}{3}$ $\frac{38}{3}$

66. $1\frac{5}{8}$ $\frac{85}{8}$ $\frac{13}{8}$

67. $5\frac{3}{7}$ $\frac{353}{7}$ $\frac{38}{7}$

$11\frac{1}{999}$ $\frac{991}{100}$

69. $12\frac{3}{5}$ $\frac{603}{5}$ $\frac{63}{5}$

70. $\frac{3}{8}$ $\frac{243}{3}$ $\frac{27}{8}$

71. $4\frac{5}{9}$ $\frac{365}{9}$ $\frac{41}{9}$

$6\frac{7}{13}$ $\frac{78785}{13}$

$8\frac{5}{14}$ $\frac{1125}{14}$ $\frac{117}{14}$

True

Critical Thinking

Students might mention any of the following: fractional parts of an hour, as in three-quarters of an hour; lengths of nails, as in $2\frac{1}{2}$ feet of pine; ingredients in a recipe, as in $1\frac{1}{2}$ cups sugar; or innings pitched, as in four and two-thirds innings.

Projects or Group Activities

To write improper fractions that represent the numbers 1, 2, 3, and 4, write the first four multiples of 5 in the numerators:

$\frac{5}{5}, \frac{10}{5}, \frac{15}{5}, \frac{20}{5}$

Answers will vary. For example, $\frac{17}{8}$.

Section 2.3

Concept Check

No. 5 does not divide into 7 evenly.

1

Objective A Exercises

3. $\frac{10}{5}$; $2 \cdot 5 = 10$

4. $\frac{16}{4}$ 4; $\frac{1 \cdot 4}{4 \cdot 4} = \frac{4}{16}$

5. $\frac{48}{16}$ 3; $\frac{3 \cdot 3}{16 \cdot 3} = \frac{9}{48}$

6. $\frac{81}{9}$ 9; $\frac{5 \cdot 9}{9 \cdot 9} = \frac{45}{81}$

$\frac{32}{8}$ 4; $\frac{3 \cdot 4}{8 \cdot 4} = \frac{12}{32}$

8. 33 11 3;

$$\frac{7 \cdot 3}{11 \cdot 3} \quad \frac{21}{33}$$

9. 51 17 3;

$$\frac{3 \cdot 3}{17 \cdot 3} \quad \frac{9}{51}$$

in $\frac{3}{4}$-inch nail; lengths of fabric, as in

$1\frac{5}{8}$ yards of material; lengths of lumber, as

90 10 9; 7·9 63
10 ·9 90

16 4 4; 3·4 12
4·4 16

32 8 4; 5·4 20
8·4 32

91 9; 3·9 27
1·9 9

25 1 25; 5·25 125

1·25 25

60 3 20; 1·20 20
3·20 60

16. 48 16 3; 1·3 3
16 ·3 48

17. 60 15 4; 11·4 44
15·4 60

300 50 6; 3·6 18

50 ·6 300

183 6;2·6 12
3·6 18

36 9 4; 5·4 20
9·4 36

49 7 7; 5·7 35
7·7 49

32 8 4; 7·4 28

8·4 32

18 9 2; 5·2 10
9·2 18

24. 36 12 3; 11·3 33

45 9 5; 7·5 35
9·5 45

42 6 7; 5·7 35
6·7 42

64 16 4; 15·4 60
16·4 64

54 18 3; 11·3 33
18 · 3 54

31. 98 14 7; 3·7 21

14 ·7 98

144 6 24; 5·24 120
6·24 144

33. 48 8 6; = 5 · 6 30
8 · 6 48

34. 96 12 8; 7·8 56
12 ·8 96

35. 42 14 3; = 5 · 3 15

14 ·3 42

36. 42 3 14; 2·14 28
3 ·14 42

37. 144 24 6; 17·6 102
24 ·6 144

1

Objective B Exercises

39. $\frac{4}{12} \quad \frac{2 \cdot 2 \quad 1}{2 \cdot 2 \cdot 3 \quad 3}$

$\frac{8}{\quad} \quad \frac{2 \cdot 2 \cdot 2}{\quad} \quad \frac{4}{\quad}$ 1 ·3 36
2

40.
22

25. 31 3; 7·3 21
1 · 3 3

3

26. 4 1 4; 9·4 6
1 · 4 4

2·11
11
1

1 1
22 2·1/1 1
41. 44 2·2 ·11 2
1 /

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

43. $\frac{2}{12} = \frac{2}{2 \cdot 2 \cdot 3} = \frac{1}{6}$

44. $\frac{75}{} = \frac{2 \cdot 5 \cdot 5}{3 \cdot 5 \cdot 5} = \frac{2}{3}$

45. $\frac{40}{36} = \frac{2 \cdot 2 \cdot 2 \cdot 5}{2 \cdot 2 \cdot 3 \cdot 3} = \frac{10}{9} = 1\frac{1}{9}$

46. $\frac{12}{8} = \frac{2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 2} = \frac{3}{2} = 1\frac{1}{2}$

47. $\frac{0}{30} = 0$

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

49. $\frac{9}{22} = \frac{3 \cdot 3}{2 \cdot 11} = \frac{9}{22}$

50. $\frac{14}{35} = \frac{2 \cdot 7}{5 \cdot 7} = \frac{2}{5}$

51. $\frac{75}{25} = \frac{3 \cdot 5 \cdot 5}{5 \cdot 5} = 3$

52. $\frac{8}{60} = \frac{2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 3 \cdot 5} = \frac{2}{15}$

55. $\frac{12}{35} = \frac{2 \cdot 2 \cdot 3}{5 \cdot 7} = \frac{12}{35}$

56. $\frac{8}{36} = \frac{2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 3 \cdot 3} = \frac{2}{9}$

57. $\frac{28}{44} = \frac{2 \cdot 2 \cdot 7}{2 \cdot 2 \cdot 11} = \frac{7}{11}$

58. $\frac{12}{16} = \frac{2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 2} = \frac{3}{4}$

59. $\frac{16}{12} = \frac{2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 3} = \frac{4}{3} = 1\frac{1}{3}$

60. $\frac{24}{18} = \frac{2 \cdot 2 \cdot 2 \cdot 3}{2 \cdot 3 \cdot 3} = \frac{4}{3} = 1\frac{1}{3}$

61. $\frac{24}{40} = \frac{2 \cdot 2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 5} = \frac{3}{5}$

62. $\frac{44}{60} = \frac{2 \cdot 2 \cdot 11}{2 \cdot 2 \cdot 3 \cdot 5} = \frac{11}{15}$

63. $\frac{8}{88} = \frac{2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 11} = \frac{1}{11}$

64. $\frac{9}{} = \frac{3 \cdot 3}{} = \frac{1}{}$

9
0

2

53. $\frac{16}{84} \quad \frac{2\cdot 2\cdot 2\cdot 2}{2\cdot 2\cdot 3\cdot 7} \quad \frac{4}{21}$

54. $\frac{20}{44} \quad \frac{2\cdot 2\cdot 5}{2\cdot 2\cdot 11} \quad \frac{5}{11}$

$\cdot 3\cdot 3\cdot 5 \quad 10$

65. $\frac{144}{36} \quad \frac{2\cdot 2\cdot 2\cdot 2\cdot 3\cdot 3}{2\cdot 2\cdot 3\cdot 3} \quad 3\ 4$

66. $\frac{140}{297} \quad \frac{2\cdot 2\cdot 5\cdot 7}{3\cdot 3\cdot 3\cdot 11} \quad \frac{140}{297}$

67. $\frac{\quad}{144} \quad \frac{48 \quad 2\cdot 2\cdot 2\cdot 2\cdot 3}{2\cdot 2\cdot 2\cdot 2\cdot 3\cdot 3} \quad 1\ 3$

68. $\frac{32}{120} = \frac{2\cdot2\cdot2\cdot2\cdot2}{2\cdot2\cdot2\cdot3\cdot5} = \frac{4}{15}$

69. $\frac{60}{100} = \frac{2\cdot2\cdot3\cdot5}{2\cdot2\cdot5\cdot5} = \frac{3}{5}$

$\frac{33}{110} = \frac{3\cdot11}{2\cdot5\cdot11} = \frac{3}{10}$

71. $\frac{36}{16} = \frac{2\cdot2\cdot3\cdot3}{2\cdot2\cdot2\cdot2} = \frac{9}{4} = 2\frac{1}{4}$

$\frac{80}{45} = \frac{2\cdot2\cdot2\cdot2\cdot5}{3\cdot3\cdot5} = \frac{16}{9} = 1\frac{7}{9}$

72.

73. $\frac{32}{160} = \frac{2\cdot2\cdot2\cdot2\cdot2}{2\cdot2\cdot2\cdot2\cdot5} = \frac{1}{5}$

Critical Thinking

Answers will vary. For example,

$\frac{4}{6}$, $\frac{6}{9}$, $\frac{8}{12}$, $\frac{10}{15}$, and $\frac{12}{18}$ are fractions that are equal to $\frac{2}{3}$.

$\frac{15}{24} = \frac{5}{8}$

1	2	3	4	5			
6	7	8	9	10			
11	12	13	14	15			

Projects or Group Activities

77a. Five provinces and territories begin with the letter N: Northwest Territories, Nunavut, Newfoundland and Labrador, Nova Scotia, New Brunswick. The fraction of provinces and territories that begin with the letter N is $\frac{5}{13}$.

b. Five provinces and territories end with a vowel: British Columbia, Alberta, Manitoba, Ontario, Nova Scotia. The fraction of provinces and territories that end with a vowel is $\frac{5}{13}$.

Section 2.4

Concept Check

1. $\frac{2}{9}, \frac{5}{9}, \frac{25}{9}, \frac{7}{9}$

2. $\frac{1}{8}, \frac{3}{8}, \frac{13}{8}, \frac{4}{8}, \frac{1}{2}$

8

12
18

70

Objective A Exercises

$\frac{2}{7}$

$\frac{1}{}$

8

$\frac{3}{7}$

3
11
5
11
8
11

9. 2
9
4
9
2
3

10. 5
8
1
8
3
4

3
14
5
14
4
14 7

12. 3
20
9
20
3
5

1
1
2
2
2 1
1
3
2
3

8
11
7
11
15
11 1 4
11

16. 9
13
7
13
16
13 1 3 13

8

5
9
5
17
5 3 2
5

5
3
7
3
12 4
3

3
8
7
8
1
8
3
8 1 8

5
12
7
1

3

12

1

1
2

13

— —

1
1
12
12

4

15

7

15

11

15

22 1 7

15 15

22. 5

7

4

7

5

7

14 2

7

23. 5 1 11 17 1 5

12 12 12 12 12

24. 5 3 7 15 7

8 8 8 18 8

A whole number other than 1

A mixed number

The number 1

A proper fraction

Objective B Exercises

•

1 3

2 6

4

3 6

6 7 1 1 6

2 8

3 12

1 3

3 3

14

5 10

14

13

14

3 6

10

7 7

10 10

13 1 3

10 10

8 32

15 60

7 21

20 60

60

1 3

6 18

7 14

18

17

18

3 21

8 56

9 36

14 56

57 1 1

56 56

5 20

12 48

5 15

48

35

48

39

60

$$4\ \overline{)\ 12}$$
$$\underline{11}$$
$$12$$

$$7\quad 14$$
$$\underline{30}\quad \underline{60}$$
$$23$$
$$\overline{60}$$

5 25
12 60

7 14

30 60

13
20

1 6

3 18
5 15
18
7 14
9 18

117
18

28

3 12
5 10
6 12

7 7

12 12

25 2 1
12 12

5 40

6 48

4
12 48

5 15

16 48

59 1 11
48 48

2 70
9 315

147
15 315

60
315

43. $\frac{2}{3}\ \frac{40}{60}$

1 12

60
7 35
12 60

87 1 27 1 9
60 60 20

3 45
4 60
4 48
5 60

7 35

12 60

128 2 8 2 2
60 60 15

2 80

3 120

3 72
120
105

8 120

257 2 17
120 120

3 45

10 150

140
150
9 54

25 150

239 1 89
150 150

47. ~~2~~ ~~48~~

277
315

7
2
5

4
5
8

7
2

7

5
6

9

7
2

2 5
7272

1 24

3 72
2 16
9 72

7 63

8 72

103 / 72 = 1 31/72

49. 3/8 ? 15/40

3 24
5 40

39/40

50. 5/9 ? 20/36

7 21

12 36

41/36 = 1 5/36

3/8 ? 9/24

51.
8 24
5 20
6 24
7 14

12 24

43/24 = 1 19/24

52. 1/2 ? 36/72

5/8 ? 45/72

7 56

Objective C Exercises

$25\frac{2}{\ }\ 2\ 10\frac{4}{\ }$

$3\underline{10}\ 3\ \underline{3}\ \underline{10}$

$\overline{10}\ 7$

$42\frac{1}{\ }\ 4\ 12\frac{6}{\ }$

57 57

12 12

$912\frac{13}{\ }\ 10\ 12\frac{1}{\ }$

$38\frac{3}{\ }\ 3\ 16\frac{6}{\ }$

$2\frac{5}{\ }\quad 2\frac{5}{\ }$

16

$5\ 16\frac{11}{\ }$

4

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

7

$7\overline{\ }^{2}$

6 8

9

12

18 $9\frac{8}{\ }$

59. $7\frac{5}{\ }$

$7\overline{20}$

12 48

$2\underline{9}\quad 2\underline{27}$

Chapter 2 Fractions 2-

$$\frac{72}{9}$$

$$\frac{137}{72} \quad 1\frac{65}{72}$$

53. (ii)

$$\frac{16}{\quad} \cdot \frac{48}{\quad}$$

$$\frac{47}{9}$$

$$48$$

60. $\frac{1}{\quad}$ $\frac{11}{\quad}$

$$9\,2 \quad 9 \quad 22$$

$$3\frac{3}{\quad} \quad 3\frac{6}{\quad}$$

$$\frac{11 \qquad 22}{\quad}$$

$$12\ \frac{17}{22}$$

6
2 3

13

8 13 3

62. 8 40 21

6

14 21

40

63. 8 29 30 116 8 120

7 11 40 7 33 120

149 29
15 120 16 120

64. 17 5 17 15

48
3 24 11 3 22 48

37

20 48

3 15
17 8 17 40

7 7 7 14

40

24 40 29

14 7 14 49

84
29 13 21 29 52 84

101 17
43 84 44 84

76 5 7 15 18

5 10
3 9 3 18

25 7
10 18 11 18

5 20
7 9 7 36

27 2 21

12 36
9 41 10 5

36 36

70. 3 2 1 3 12 6

2 4 3 2 12 9

16 5 1 12 10

6 12 25 8 12 1

2 2 1 2 6 12

3 3 2 3 12 8

4 4 1 4 3 12

17 5

9 12 10 12

72. 3 3 1 3 35 105

1 21
7
5 105

7 1 2 15 105

67. $5\frac{7}{8} \quad 5\frac{21}{24}$

$27\frac{5}{27} \quad 27\frac{0}{1}$

$12\frac{71}{105}$

73. $\frac{1}{3} \quad \frac{45}{3}$

$\frac{2}{90}$

Chapter 2 Fractions 2-

12 24

31 7

32 33

24 24

$3\frac{1}{5}$ $3\frac{18}{90}$

1 10

8 8

9 90

73

14 90

$6 9\frac{5}{6} \quad 6\frac{20}{36}$

$6\frac{5}{6} \quad 6\frac{15}{36}$

$2\frac{5}{2} \quad 2\frac{10}{18} \quad \frac{36}{45} \quad 14\frac{9}{36} \quad 15\frac{9}{36} \quad 15\frac{1}{4}$

$2 8\frac{3}{2} \quad 2\frac{18}{48}$

$4\frac{7}{12} \quad 4\frac{28}{48}$

$3\frac{5}{16} \quad 3\frac{15}{48}$

$9 48\frac{61}{48} \quad 10\frac{13}{48}$

$11\frac{1}{2} \quad 11\frac{2}{4}$

3

$\frac{44}{5} \quad \frac{1}{4}$

$11\frac{4}{5} \quad 12\frac{1}{4}$

The distance is $12\frac{1}{4}$ inches.

4

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

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

$\frac{7}{8}$

3

The pole is $3\frac{7}{8}$ metres long.

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

$9\frac{1}{9} \quad 9\frac{4}{12}$

$13\frac{13}{12} \quad 14\frac{1}{12}$

$4 9\frac{8}{6} = 4 18\frac{16}{18}$

$9 \quad \frac{1}{6} \quad 18\frac{3}{18} = 9$

$13\frac{19}{18} = 14\frac{1}{18}$

82. $\frac{2}{5} \quad \frac{2}{45}$

$4_8 \quad 4_{72}$

$2 \quad 16$

$\frac{2}{9} \quad \frac{2}{72}$

$72\frac{61}{72}$

$18\frac{5}{24} = 1\frac{15}{24}$

$3 \quad 3$

$\frac{7}{7} \quad \frac{7}{7} = 7$

$\frac{24}{11\frac{22}{24}} \quad \frac{24}{11\frac{11}{12}}$

84. Yes

85. No

Objective D Exercises

78. $29\frac{4}{36} + 2\frac{16}{36}$

Strategy To find the shaft length, add the three distances.

$5\frac{7}{36} \quad 5\frac{21}{36}$

$-\frac{12}{36} \quad -\frac{36}{36}$

$7\frac{37}{36} \quad 8\frac{1}{36}$

79. $5\frac{5}{6} = 5\frac{20}{24}$

$3\frac{3}{8} = 3\frac{9}{24}$

$-\frac{8}{24} \quad -\frac{24}{24}$

$8\frac{29}{24} = 9\frac{5}{24}$

Solution $\frac{3}{8} \quad \frac{6}{16}$

$\frac{11}{16} \quad \frac{11}{16}$

$\frac{1}{4} \quad \frac{4}{16}$

$\frac{21}{16} \quad \frac{5}{16}$

$1\frac{5}{16}$

The shaft length is $1\frac{5}{16}$ cm.

Strategy To find shaft length, add the lengths of the three parts.

Solution $16\frac{5}{} = 16\frac{5}{}$

$8\frac{7}{} = 6\frac{14}{16}$

$1\frac{3}{8} = 1\frac{6}{16}$

$\frac{25}{16} =$

$8\frac{9}{16}$ The shaft length is

$8\frac{9}{16}$ centimetres.

Strategy To find the total thickness, add the table-top thickness to the veneer thickness.

Solution $18\frac{1}{1}\ 1\frac{2}{16}$

$\frac{3}{16}\ \frac{3}{16}$

$1\frac{5}{16}$

The total thickness is $\frac{5}{}$

The sum represents the height of the table.

90a. Strategy To find the total number of hours worked, add the five amounts.

Solution $5\ 5$

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

$\frac{1}{}\qquad\frac{4}{}$

$2\frac{3}{1}\ \ 2\ 12$

$1\frac{1}{1}\ 1\frac{3}{}$

b. Strategy To find the week's total salary, multiply the hours worked (20) by the pay for 1 hour ($11).

Solution 11

$\frac{20}{}$

220

Your total salary for the week is $220.

Strategy To find the total course length, add the three sides.

Solution $4\ \frac{3}{}\ =4\ \frac{3}{}$

10

$3\frac{7}{}=3\frac{7}{}$

10

$\frac{1}{}\qquad\frac{5}{}$

$2\ \ 2=2\ 10$

$9\frac{15}{}=10\frac{1}{}$

102

The total course length is $10\ 2\frac{1}{}$ km.

Strategy To find the thickness of the wall, add the thickness of the stud to the thickness of the dry wall on each side of the stud.

Solution $3\ 8\ 3\ 8$

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

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

$\frac{1}{}\ \ \frac{4}{}$

$\frac{2\ \ 8}{}$

$3\frac{13}{8}\ 4\frac{5}{8}$

The total thickness of the wall is

$$\frac{24}{7\frac{2}{3}} = \frac{12}{7\frac{8}{12}}$$

$$18 \quad 20$$
$$12$$

A total of 20 hours was worked.

$4\frac{5}{8}$ in.

Strategy To find the thickness of the wall, add the thickness of the stud to the thickness of the dry wall on each side of the stud.

Solution $5\frac{5}{8} + 5\frac{5}{8}$

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

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

$5\frac{13}{8} = 6\frac{5}{8}$

The total thickness of the wall is $6\frac{5}{8}$ in.

Strategy To find the thickness of the wall, add the thickness of the stud to the thickness of the dry wall on each side of the stud.

Solution $3\frac{5}{8} + \frac{5}{8} + \frac{5}{8}$

$3\frac{15}{8} = 4\frac{7}{8}$

The total thickness of the wall is $4\frac{7}{8}$ in.

95. Strategy To find the minimum length of bolt needed, add the thickness of each piece of wood to the thickness of the washer and the thickness of the nut.

Solution $= \frac{8}{16} + \frac{10}{16} + \frac{1}{16} + \frac{1}{16}$

Critical Thinking

96. $\frac{1}{3} + \frac{1}{6} + \frac{1}{8} + \frac{1}{12} + \frac{2}{5}$

$\frac{40}{120} + \frac{20}{120} + \frac{15}{120} + \frac{10}{120} + \frac{48}{120}$

$= \frac{133}{120} = 1\frac{13}{120}$

No, this is not possible. The total cannot be greater than 1, which represents all the people surveyed.

Projects or Group Activities

$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$

There is no smallest unit fraction. No matter how small the unit fraction is, we can always add 1 to the denominator to make it even smaller.

99. $\frac{7}{12} + \frac{4}{12} + \frac{3}{12} + \frac{1}{3} + \frac{1}{4}$

$\frac{11}{24} + \frac{8}{24} + \frac{3}{24} + \frac{1}{3} + \frac{1}{8}$

101. $\frac{5}{12} + \frac{3}{12} + \frac{2}{12} + \frac{1}{4} + \frac{1}{6}$

Section 2.5

Concept Check

$\frac{5}{7} \quad \frac{3}{4} \quad \frac{5}{3} \quad \frac{3}{2}$

1.

$\frac{11}{9} \quad \frac{11}{9} \quad \frac{11}{9} \quad \frac{11}{9}$

$\frac{7}{4} \quad \frac{7}{4} \quad \frac{3}{1} \quad \frac{1}{1}$

16 = 16

Chapter 2 Fractions 2-

$+\frac{3}{16} = \frac{3}{16}$

$\frac{22}{\quad} = 1\frac{6}{\quad}$ $1\frac{3}{\quad}$

16 16 8

The bolt must be $1\frac{3}{8}$ in. long.

3. $\frac{11}{18}$

$\frac{1}{\quad}$

4. 3

Objective A Exercises

$\frac{9}{17}$

$\frac{7}{17}$

$\frac{2}{17}$

$\frac{11}{15}$

$\frac{3}{15}$

$\frac{8}{15}$

$\frac{11}{12}$

$\frac{7}{12}$

$\frac{1}{12}$ 3

$\frac{13}{15}$

$\frac{4}{15}$

$= \frac{3}{155}$

$\frac{9}{20}$

$\frac{7}{20}$

$\frac{1}{10}$

$\frac{48}{55}$

$\frac{13}{55}$

$\frac{35}{5511} = \frac{7}{42}$

$\frac{11}{24}$

$\frac{5}{24} = \frac{1}{4}$

$\frac{23}{13}$

$\frac{13}{30}$

$\frac{10}{30} \frac{1}{3}$

14. $\frac{17}{42}$

$\frac{5}{42}$

$\frac{12}{42} = \frac{2}{7}$

$\frac{13}{14}$

$\frac{5}{14}$

$\frac{4}{14} 7$

$\frac{7}{8}$

$\frac{5}{8}$

$\frac{1}{4}$

$\frac{17}{24}$

$\frac{11}{24}$

$\frac{1}{4}$

$\frac{17}{6}$
5

Chapter 2 Fractions 2-

$\frac{1}{9}$

3

0

$\frac{1}{1}$

$\frac{3}{0}$

$\frac{8}{65} = \frac{4}{25}$

$\frac{5}{13}$

30 15

19. Yes

20. No

Objective B Exercises

$\frac{2}{3}\ \frac{4}{6}$

$\frac{1}{6}\ \frac{1}{6}$

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

$\frac{7}{8} = \frac{14}{16}$

$\frac{5}{16} = \frac{5}{16}$

$\frac{9}{16}$

$\frac{5}{2}\ \frac{35}{16}$

$\frac{56}{19}$

$\frac{56}{}$

$6\frac{5}{7} = 42\frac{35}{}$

$= 42\frac{18}{}$

$\frac{17}{42}$

25. $\frac{5}{7} - \frac{10}{14}$

$\frac{3}{14} - \frac{3}{14}$

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

26. $\frac{5}{9} = \frac{25}{45}$

$\frac{7}{} = \frac{21}{45}$

$\frac{4}{45}$

$\frac{8}{15}\ \frac{32}{60}$

$7\frac{9}{16} = 18\frac{14}{32}$

$\frac{1}{6} = \frac{3}{18}$

$\frac{11}{18}$

$9\frac{1}{16} = 18\frac{2}{32}$

$\frac{17}{32} = \frac{17}{32}$

$\frac{1}{32}$

$\frac{29}{60}\ \frac{58}{120}$

$\frac{3}{40}\ \frac{9}{120}$

$\frac{49}{120}$

$12\frac{11}{3} = 60\frac{55}{36}$

$\frac{5}{19} = \frac{60}{60}$

$\frac{11}{15}\ \frac{33}{45}$

$\frac{5}{45}\ \frac{25}{}$

$\frac{8}{45}$

$\frac{11}{24} = \frac{33}{72}$

$\frac{7}{} = \frac{28}{}$

$\frac{18}{5}\ \frac{72}{72}$

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

$\frac{55}{}$

$$\frac{7}{20}\cdot\frac{21}{60}$$

$$\frac{11}{60}$$

$$\frac{42}{42}$$

$$\frac{22}{42}\cdot\frac{11}{21}$$

12 11 = 60 55

11=44

60
11
60

17 51
20 60

7 28
60
23
60

13=39

2060
1 6= 10 60
29
60

5 15
18

7 14
18
1
18

(i)

Objective C Exercises

5 12 7

2 12 5
2 1
3 =3
12 6

16 15 11

11 15 8

5 15 3 5 1 5

6 3 1

2

3 1

5 8 7
1

4 7
8

10 =9 3 3
6 1 =6 1

3 3

3 2
3

45. 21

3 2 21
2 5 2 5
21 21

16
21

46. 6 2 5 =5 5 7
4 4 5 =4 5 4
3 5

16 8 3 15 11 8
10 7 10 7
8 8
1

5 8 5 2

16 5 2 = 16 45 18 = 15 45 63
8 4 =8 20 =8 20
9 45 45

43

7

4
5

23 8 7 23 21 24

16 2 16 16

3 24

7 5

24

13

16 13

7 8 7 8

13

9 13 5

6=5 5 5

3 3

5= 4 5

2

5

1 4 28

52. 23 23 22

6 24 24

15 3 15 9 15 9

8 24 24

7 19

24

53. 4

9 20 8 18 39 26 18

24 5 24 15 24 15

6 18 18

15 11

18

5 15 69

12 12 11

185454

1 2 6

55. 29 2 29 4 28 4

7 3 7 3 7 3

4 4 4

3

21 4

The distance is 21 3 inches.

4

1 2 10

56. 23 23 22

4 8 8

19 3 19 3 19 3

8 8 8

3 7

8

7

The distance is 3 8 inches.

57. 23 3 23 3 22 23

20 20 20

7 3 7 12 7 12

5 20 20

15 11

20

58. 3 9 33

12 12 11

8 7 24 24

7 12 10 24 24

23

24

10 9 5 = 10 45 25 = 9

70

45 511 =533 =533

154545

11 11 11 22 11 22

27 54 54

47

54

$4\frac{37}{45}$

60. $6\frac{1}{6} - 5\frac{5}{20}$

$3\frac{3}{15} - 3\frac{9}{15}$

$2\frac{11}{15}$

61. No

Objective D Exercises

Strategy Subtract the larger segment of the shaft $7\frac{7}{8}$ feet from the total length of the shaft $\frac{2}{3}$

Solution $16\frac{2}{3} = 16\frac{16}{24} = 15\frac{40}{24}$

$7\frac{7}{8} = 7\frac{21}{24} = 7\frac{21}{24}$

$8\frac{19}{24}$

The missing dimension is $\frac{19}{24}$ feet.

Strategy Subtract the larger shaft segment $2\frac{7}{8}$ inches from the total shaft length $12\frac{3}{8}$ inches.

Solution $12\frac{3}{8} \quad 11\frac{11}{8}$

$2\frac{7}{8} \quad 2\frac{7}{8}$

$9\frac{4}{8} \quad 9\frac{1}{2}$

The missing dimension is $\frac{1}{2}$ inches.

Strategy To find how much farther the horses run in the Queen's Plate than in the Preakness Stakes, subtract the distance run in the Preakness Stakes from the distance run in the Queen's Plate.

Solution $1\frac{1}{4} = 1\frac{4}{16}$

$1\frac{3}{16} = 1\frac{3}{16}$

$\frac{1}{16}$

The horses run $\frac{1}{16}$ mile farther in the Queen's Plate than in the Preakness Stakes.

Strategy To find how much farther the horses run, subtract the distance run in the Preakness Stakes $1\frac{3}{16}$ miles from the distance run in the Belmont Stakes $1\frac{1}{2}$ miles.

Solution $1\frac{8}{16} = 1\frac{3}{5}$

The horses run $\frac{5}{16}$ mile farther in the Belmont Stakes than in the Preakness Stakes.

65. Strategy To find the difference in the desk

than in the Preakness Stakes, subtract the distance run in the

heights, subtract the shorter

3

desk height $56\frac{}{4}$ centimetres

from the taller desk height

$58\frac{1}{}$ centimetres .

Preakness Stakes $1\frac{3}{16}$ miles

from the distance run in the

Queen's Plate $1\frac{1}{4}$ miles .

2

Solution

$$58\frac{1}{2} - 58\frac{2}{4} + 57\frac{6}{4}$$

$$56\frac{3}{4} - 56\frac{3}{4} + 56\frac{3}{4}$$

$$\frac{4}{4} - \frac{4}{4} + \frac{4}{4}$$

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

The new desk is $1\frac{3}{4}$ centimetres shorter than a desk of standard height.

66a. Strategy Add the distance from the starting point to the first checkpoint to the distance from the first checkpoint to the second checkpoint.

Solution $3\frac{3}{8} \quad 3\frac{9}{24}$

$4\frac{1}{3} \quad 4\frac{8}{24}$

$7\frac{17}{24}$

The distance is $7\frac{17}{24}$ kilometres.

b. Strategy To find the distance, subtract the distance from the starting point to the second checkpoint

$7\frac{17}{24}$ kilometres from the total distance (12 kilometres).

Solution $12 \quad 11\frac{24}{24}$

$7\frac{17}{24} \quad 7\frac{17}{24}$

$4\frac{7}{24}$

The distance from the second checkpoint to the finish line is $4\frac{7}{24}$ kilometres.

Solution $7\frac{3}{8} \quad 7\frac{9}{24}$

$10\frac{1}{3} \quad 10\frac{8}{24}$

$17\frac{17}{24}$

The distance to be travelled during the first two days is $17\frac{17}{24}$ kilometres.

b. Strategy To find the distance, subtract the miles hiked $17\frac{17}{24}$ from the total kilometres $27\frac{1}{2}$

Solution $27\frac{1}{2} \quad 27\frac{12}{24} \quad 26\frac{36}{24}$

$17\frac{17}{24} \quad 17\frac{17}{24} \quad 17\frac{17}{24}$

$9\frac{19}{24}$

On the third day, $\frac{19}{24}$ kilometres remain.

The difference represents the distance that will remain to be travelled after the first day.

The difference represents how much farther the hikers plan to travel on the second day than on the first day.

Strategy To find how much weight must be lost during the third month:

Add the weight lost during the

24

67a. Strategy Add the distance to be travelled

$$3$$

the first day $7\frac{}{8}$ kilometres to

the distance to be travelled the

$$1$$

second day $10\frac{}{3}$ kilometres .

$$1$$

first month $4\frac{}{4}$ kilograms to

the amount lost during the

$$1$$

second month $5\frac{}{2}$ kilograms .

- Subtract the total lost during

  the first two months from the total goal (15 kilograms).

Solution $4\frac{1}{4}$ $4\frac{1}{4}$ 15 $14\frac{4}{4}$

$5\frac{1}{4}$ $5\frac{2}{4}$ $9\frac{3}{4}$ $9\frac{3}{4}$

$\frac{2}{4}$ $\frac{4}{4}$ $\frac{4}{4}$ $\frac{4}{4}$

$9\frac{3}{4}$ $5\frac{1}{4}$

The patient has $5\frac{1}{4}$ kilograms more to lose.

71a. The wrestler lost $2\frac{3}{4}$ kilograms in week 1 and $2\frac{1}{4}$ kilograms in week 2, or 4 kilograms total. Since less than 6 kilograms needs to be lost, the wrestler can attain the weight class by losing under 2 kilograms. Yes, this is less than the $\frac{1}{4}$ kilograms lost in the second week.

b. Strategy To find how much weight must be lost:

Add the amounts of weight lost during the first two weeks.

Subtract the current weight loss total from the required amount $5\frac{3}{4}$ kilograms.

Solution $2\frac{3}{4}$ $5\frac{3}{4}$ $4\frac{7}{4}$

$2\frac{1}{4}$ $5\frac{4}{4}$

$\frac{4}{4}$ $\frac{4}{3}$

$4\frac{4}{4}$ 5

two pieces of dry wall for each wall.

Subtract the smaller total thickness from the larger total thickness.

Solution 2 6 stud wall: $5\frac{5}{8}$ $5\frac{5}{8}$

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

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

$5\frac{13}{8}$ $6\frac{5}{8}$

2 4 stud wall: $3\frac{5}{8}$

$\frac{5}{8}$

$\frac{5}{8}$

$\frac{15}{8}$ $\frac{7}{8}$

$3\frac{7}{8}$ 4

$6\frac{5}{8}$ 5 $\frac{13}{8}$

$4\frac{7}{8}$ $4\frac{7}{8}$

$18\frac{6}{8}$ $1\frac{3}{4}$

$\frac{3}{4}$

The difference is $1\frac{3}{4}$ inches.

The electrician's income is 1, that is,

100%. $1\frac{15}{15}$

$\frac{15}{4}$ 4

Chapter 2 Fractions 2-

4 4 The wrestler needs to lose

$\frac{3}{4}$ kilograms.

Strategy To find the difference:

Find the thickness of each wall by adding the thickness of each stud to the thickness of

$\frac{15}{15}$

$\frac{11}{15}$

$\frac{11}{15}$ of the income is not spent for housing.

Critical Thinking

To find the missing number, subtract $2\frac{1}{2}$ from $5\frac{1}{3}$.

$$5\frac{1}{3} \quad 5\frac{2}{6} \quad 4\frac{8}{6}$$

$$2\frac{1}{3} \quad 2\frac{3}{6} \quad 2\frac{3}{6}$$

$$2\,6\frac{5}{6}$$

To find the missing number, add $1\frac{5}{8}$ to $4\frac{1}{2}$.

$$1\frac{5}{8} \quad 1\frac{5}{8} \quad 4\frac{1}{2} \quad 4\frac{4}{8}$$

$$5\frac{9}{8} \quad 6\frac{1}{8}$$

Projects or Group Activities

76. Right diagonal: $\frac{3}{8}, \frac{5}{8}, \frac{6}{8}, \frac{5}{8}, \frac{4}{8}, \frac{15}{8}$

$$\frac{4}{8} \quad \frac{8}{8} \quad \frac{8}{8} \quad \frac{8}{8} \quad \frac{8}{8}$$

Left diagonal: $\frac{12}{8}; \frac{15}{8}, \frac{12}{8}, \frac{3}{8}$

Top across:

$$\frac{3}{8}, \frac{3}{4}, \frac{3}{8}, \frac{6}{8}, \frac{9}{8}; \frac{15}{8}, \frac{9}{8}, \frac{6}{8}, \frac{3}{8}$$

Left down:

$$\frac{3}{8}, \frac{1}{2}, \frac{3}{8}, \frac{4}{8}, \frac{7}{8}; \frac{15}{8}, \frac{7}{8}, 1$$

Middle across: $1\frac{5}{8}, \frac{5}{8}, \frac{13}{8};$

$$\frac{15}{8} \quad \frac{13}{8} \quad \frac{2}{8} \quad \frac{1}{8}$$

Bottom across: $\frac{7}{8}, \frac{7}{8}, \frac{11}{8};$

$$\frac{15}{8} \quad \frac{11}{8} \quad \frac{4}{8} \quad \frac{1}{8}$$

$\frac{3}{8}$	$\frac{3}{4}$	$\frac{3}{4}$
1	$\frac{5}{8}$	$\frac{1}{4}$
$1\frac{1}{2}$	1	$\frac{7}{8}$
	2	

Check Your Progress: Chapter 2

1.

	2	3
$12 =$	$2 \cdot 2$	3
$18 =$	2	$3 \cdot 3$

$\text{LCM} = 2 \cdot 2 \cdot 3 \cdot 3 = 36$

2.

	2	3
$6 =$	2	3
$9 =$		$3 \cdot 3$
$18 =$	2	$3 \cdot 3$

$\text{LCM} = 2 \cdot 3 \cdot 3 = 18$

3.

	2	5	7
$2 =$	2		
$5 =$		5	
$7 =$			7

$\text{LCM} = 2 \cdot 5 \cdot 7 = 70$

4.

	2	3	7
$28 =$	$2 \cdot 2$		7
$36 =$	$2 \cdot 2$	$3 \cdot 3$	

$\text{LCM} = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 7 = 252$

5.

	2	3
$18 =$	2	$3 \cdot 3$
$24 =$	$2 \cdot 2 \cdot 2$	3

$\text{GCF} = 2 \cdot 3 = 6$

6.

	2	3
27 =		3·3·3
54 =	2	3·3·3

GCF = 3·3·3 = 27

7.

	2	3	7
3 =		3	
6 =	2	3	
14 =	2		7

GCF = 1

8.

	2	3	5	7
30 =	2	3	5	
70 =	2		5	7
105 =		3	5	7

GCF = 5

9. $\frac{36}{45} = \frac{2 \cdot 2 \cdot 3 \cdot 3}{3 \cdot 3 \cdot 5} = \frac{4}{5}$

10. $\frac{17}{51} = \frac{17 \cdot 1}{17 \cdot 3} = \frac{1}{3}$

11. $\frac{25}{36} = \frac{5 \cdot 5}{2 \cdot 2 \cdot 3 \cdot 3}$; $\frac{25}{36}$ is in simplest form.

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

13. $\frac{2}{9}$

$\frac{4}{9}$

$\frac{2}{3}$

$\frac{17}{24}$

$\frac{5}{24}$

$\frac{1}{2}$

$\frac{7}{9} \frac{14}{18}$

$\frac{7}{18} \frac{18}{18}$

$\frac{7}{18}$

$\frac{7}{7}$

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

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

$\frac{3}{5}$

17. $\frac{5}{48} \frac{40}{48}$

$\frac{11}{16} \frac{33}{48}$

$1 \frac{25}{48}$

18. $\frac{3}{52} \frac{39}{52}$

$\frac{9}{26} \frac{18}{52}$

$\frac{21}{52}$

19. $\frac{2}{3} \frac{32}{48}$

$\frac{3}{48} \frac{9}{48}$

$\frac{23}{48}$

20. $\frac{3}{5}\cdot\frac{12}{20}$

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

$\frac{17}{20}$

$2\frac{1}{2}\cdot 2\frac{3}{10}$

$7\frac{1}{2}\cdot 7\frac{2}{15}$

$9\frac{5}{30}\cdot 9\frac{1}{6}$

$11\frac{4}{9}\cdot 11\frac{8}{18}$

$7\frac{1}{2}\cdot 7\frac{3}{6}$

$18\frac{11}{18}$

23. $7\frac{6}{7}\cdot 7\frac{12}{14}$

$\frac{1}{12}\cdot\frac{7}{114}$

$\frac{5}{6}$

$\frac{13}{14}\cdot\frac{26}{28}$

$3\frac{1}{18}\cdot 3\frac{7}{56}$

$2\frac{19}{56}$

25. $5\frac{8}{9}\cdot 5\frac{16}{18}$

$\frac{15}{94}\cdot\frac{9}{20}$

$\frac{7}{37}\cdot\frac{6}{10}$

$\frac{10}{21}\cdot\frac{20}{1}$

$16\frac{20}{21}\cdot 17\frac{20}{1}$

27. $8\frac{9}{4}$

$5\frac{4}{3}\cdot 5\frac{4}{3}$

$\frac{4}{1}$

4

28. $8\frac{1}{4}\cdot 8\frac{3}{12}\cdot 7\frac{15}{12}$

$5\frac{5}{4}\cdot 5\frac{10}{12}\cdot 5\frac{10}{12}$

$2\frac{5}{12}$

Section 2.6

Concept Check

1. $\frac{5}{9}\cdot\frac{2}{3}\cdot\frac{5}{9}\cdot\frac{2}{3}\cdot\frac{10}{27}$

2. $\frac{6}{7}\cdot 4\cdot\frac{64}{7}\cdot\frac{24}{1}\cdot 3\frac{3}{7}$

Yes

Less than

Objective A Exercises

5 15

7 6 7 18

31 2 7 2 ·7 2

12 13 5. 3 8 3 ·8 3 ·2

13 1

1

18 18

·7 7

·2 ·2 12

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

1

7. $\frac{5}{16} \cdot \frac{7}{15} = \frac{5 \cdot 7}{16 \cdot 15} = \frac{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5}{48}$

1

8. $\frac{3}{8}\ \frac{6}{7}\ \frac{3\cdot 6}{8\cdot 7}\ \frac{3\cdot 2\cdot 3}{2\cdot 2\cdot 2\cdot 7}\ \frac{9}{28}$

9. $\frac{1}{6}\ \frac{1}{8}\ \frac{1\cdot 1}{6\cdot 8}\ \frac{1}{2\cdot 3\cdot 2\cdot 2\cdot 2}\ \frac{1}{48}$

10. $\frac{25}{5}\ \frac{2\cdot 5}{6}\ \frac{2\cdot 5}{5\cdot 6}\ \frac{1}{5\cdot 2\cdot 3}\ \frac{1}{3}$

11. $\frac{11}{12}\ \frac{6}{7}\ \frac{11\cdot 6}{12\cdot 7}\ \frac{11\cdot 2\cdot 3}{2\cdot 2\cdot 3\cdot 7}\ \frac{11}{14}$

12. $\frac{11}{12}\ \frac{3}{5}\ \frac{11\cdot 3}{12\cdot 5}\ \frac{11\cdot 3}{2\cdot 2\cdot 3\cdot 5}\ \frac{11}{20}$

13. $-\frac{27}{9}\ \frac{8\cdot 27}{4\cdot 9}\ \frac{2\cdot 2\cdot 2\cdot 3\cdot 3\cdot 3}{3\cdot 3\cdot 2\cdot 2}\ 6$

14. $\frac{3}{5}\ \frac{3}{10}\ \frac{3\cdot 3}{5\cdot 10}\ \frac{3\cdot 3}{5\cdot 2\cdot 5}\ \frac{9}{50}$

15. $\frac{5\cdot 1}{6\cdot 2}\ \frac{\cdot 1}{6\cdot 2}\ \frac{5}{2\cdot 3\cdot 2}\ \frac{}{12}$

16. $\frac{3}{8}\ \frac{5}{12}\ \frac{3\cdot 5}{8\cdot 12}\ \frac{3\cdot 5}{2\cdot 2\cdot 2\cdot 2\cdot 2\cdot 3}\ \frac{5}{32}$

17. $\frac{16}{9}\ \frac{27}{4}\ \frac{16\cdot 27}{9\cdot 4}\ \frac{2\cdot 2\cdot 2\cdot 2\cdot 3\cdot 3\cdot 3}{3\cdot 3\cdot 2\cdot 2}\ 6$

21. $\frac{7}{8}\ \frac{3}{14}\ \frac{7\cdot 3}{8\cdot 14}\ \frac{7\cdot 3}{2\cdot 2\cdot 2\cdot 2\cdot 7}\ \frac{3}{16}$

22. $\frac{2}{9}\ \frac{4}{5}\ \frac{2\cdot 4}{9\cdot 5}\ \frac{2\cdot 2\cdot 2}{3\cdot 3\cdot 5}\ \frac{8}{45}$

23. $\frac{7}{10}\ \frac{3}{8}\ \frac{7\cdot 3}{10\cdot 8}\ \frac{7\cdot 3}{2\cdot 5\cdot 2\cdot 2\cdot 2}\ \frac{21}{80}$

24. $\frac{5}{12}\ \frac{6}{7}\ \frac{5\cdot 6}{12\cdot 7}\ \frac{5\cdot 2\cdot 3}{2\cdot 2\cdot 3\cdot 7}\ \frac{5}{14}$

25. $\frac{15}{8}\ \frac{16}{3}\ \frac{15\cdot 16}{8\cdot 3}\ \frac{3\cdot 5\cdot 2\cdot 2\cdot 2\cdot 2}{2\cdot 2\cdot 2\cdot 3}\ 10$

26. $\frac{5}{6}\ \frac{4}{15}\ \frac{5\cdot 4}{6\cdot 15}\ \frac{5\cdot 2\cdot 2}{2\cdot 3\cdot 3\cdot 5}\ \frac{2}{9}$

27. $\frac{1}{2}\ \frac{2}{15}\ \frac{1\cdot 2}{2\cdot 15}\ \frac{1\cdot 2}{2\cdot 3\cdot 5}\ \frac{}{15}$

28. $\frac{3}{8}\ \frac{5}{16}\ \frac{3\cdot 5}{8\cdot 16}\ \frac{3\cdot 5}{2\cdot 2\cdot 2\cdot 2\cdot 2\cdot 2\cdot 2}\ \frac{15}{128}$

29. $\frac{5}{7}\ \frac{14}{15}\ \frac{5\cdot 14}{7\cdot 15}\ \frac{5\cdot 2\cdot 7}{7\cdot 3\cdot 5}\ \frac{2}{3}$

$\frac{3}{4}\ \frac{36}{5}\ \frac{3\cdot 36}{4\cdot 5}\ \frac{3\cdot 2\cdot 2\cdot 3\cdot 3}{2\cdot 2\cdot 5}\ \frac{27}{5}$

$$9 \quad 8 \quad 9 \cdot 8 \quad 3 \cdot 3 \cdot 2 \quad \cdot 2 \cdot 2$$

$$1 \quad 1 \quad 1 \quad 1 \quad 1$$

30.

$$8 \quad 41 \quad 8 \cdot 41 \quad \cancel{2} \cdot \cancel{2} \cdot 2 \cdot 41 \quad 82$$

$$1 \quad 1$$

18. $\frac{5}{8}\,\frac{16}{15}\quad\frac{5\cdot16}{8\cdot15}\quad\frac{}{2\cdot2\cdot2\cdot3\cdot5}\quad\frac{}{3}$

19. $\frac{3}{2}\,\frac{4}{9}\quad\frac{3\cdot4}{2\cdot9}\quad\frac{3\cdot2\cdot2}{2\cdot3\cdot3}\quad\frac{2}{3}$

20. $\frac{5}{3}\,\frac{3}{7}\quad\frac{5\cdot3}{3\cdot7}\quad\frac{5}{7}$

31. $\frac{}{5}\,\frac{}{42}\quad\frac{}{5\cdot42}\quad\frac{}{2\cdot3\cdot7}\quad\frac{}{7}$

$\frac{}{12}\quad\frac{}{65}\quad\frac{}{12\cdot65}\quad\frac{}{2\cdot2\cdot3\cdot5\cdot13}\quad\frac{}{26}$

$\frac{}{16}\quad\frac{}{55}\quad\frac{}{16\cdot55}\quad\frac{}{2}\quad\frac{}{10}$

32. $\frac{}{33}\,72\quad\frac{}{33\,72}\quad\frac{2_1\,2_1\,2\,5\,11}{3\,1\,1\,2\,2\,2\,3\,3}\quad\frac{1}{27}$

33. $\frac{12}{5}\,\frac{5}{3}\quad\frac{12\cdot5}{5\cdot3}\quad\frac{2\cdot2\cdot3\cdot5}{5\cdot3}\quad\frac{}{4}$

34. $\frac{17}{9} \cdot \frac{81}{17} \cdot \frac{17}{81} \cdot \frac{173}{3317}$

35. $\frac{10}{21} \cdot \frac{14}{15} \cdot \frac{1014}{2115} \cdot \frac{2527}{3735} \cdot \frac{4}{9}$

36. $\frac{19}{64} \cdot \frac{48}{95} \cdot \frac{1948}{6495} \cdot \frac{19222}{2222225} \cdot \frac{2}{19} \cdot \frac{3}{20}$

37. Answers will vary. For example, $\frac{3}{4}$ and $\frac{4}{3}$

38. $\frac{7}{5} \cdot \frac{15}{12} \cdot \frac{7 \cdot 15}{42} \cdot \frac{7 \cdot 3 \cdot 5}{12 \cdot 42} \cdot \frac{}{2 \cdot 2 \cdot 3 \cdot 2 \cdot 3 \cdot 7} \cdot \frac{}{24}$

39. $\frac{32}{9} \cdot \frac{3}{8} \cdot \frac{32 \cdot 3}{9 \cdot 8} \cdot \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}{3 \cdot 3 \cdot 2 \cdot 2 \cdot 2} \cdot \frac{4}{3} \cdot \frac{1}{3}$

40. $\frac{5}{9} \cdot \frac{3}{20} \cdot \frac{5 \cdot 3}{9 \cdot 20} \cdot \frac{5 \cdot 3}{3 \cdot 3 \cdot 2 \cdot 2 \cdot 5} \cdot \frac{}{12}$

41. $\frac{7}{} \cdot \frac{15}{} \cdot \frac{7 \cdot 15}{} \cdot \frac{7 \cdot 3 \cdot 5}{} \cdot \frac{5}{} \cdot \frac{}{1}$

45. $\frac{5}{14} \cdot \frac{14 \cdot 5}{7} \cdot \frac{2 \cdot 7 \cdot 5}{1 \cdot 7} \cdot \frac{}{1 \cdot 7} \cdot \frac{}{10}$

46. $\frac{2}{3} \cdot \frac{6}{3 \cdot 1} \cdot \frac{2 \cdot 6}{3 \cdot 1} \cdot \frac{2 \cdot 2 \cdot 3}{3 \cdot 1} \cdot \frac{4}{}$

47. $\frac{5}{12} \cdot \frac{5 \cdot 40}{12 \cdot 1} \cdot \frac{5 \cdot 2 \cdot 2 \cdot 2 \cdot 5}{2 \cdot 2 \cdot 3 \cdot 1} \cdot \frac{50}{3} \cdot 16 \cdot \frac{2}{3}$

48. $\frac{1}{3} \cdot \frac{1}{1} \cdot \frac{1}{3} \cdot \frac{4}{3} \cdot \frac{1 \cdot 2 \cdot 2}{3} \cdot \frac{4}{3 \cdot 3} \cdot \frac{}{9}$

49. $\frac{2}{5} \cdot 2 \cdot \frac{1}{2} \cdot \frac{2}{5} \cdot \frac{5}{2} \cdot 5 \cdot 1 \cdot \frac{}{5 \cdot 2}$

50. $\frac{}{7} \cdot \frac{}{4} \cdot \frac{}{15} \cdot \frac{}{4} \cdot \frac{}{3 \cdot 5} \cdot \frac{}{2 \cdot 2} \cdot \frac{}{2 \cdot 2} \cdot \frac{}{2 \cdot 3 \cdot 5} \cdot 1 \cdot \frac{}{8} \cdot \frac{}{15} \cdot \frac{}{8} \cdot \frac{}{15} \cdot \frac{}{2}$

51. $\frac{}{1} \cdot \frac{}{5} \cdot \frac{1}{11} \cdot \frac{1}{5} \cdot \frac{}{11} \cdot \frac{}{5} \cdot \frac{}{1} \cdot 2 \cdot \frac{}{5} \cdot \frac{}{22} \cdot \frac{}{5} \cdot \frac{}{22} \cdot \frac{}{5} \cdot \frac{}{2} \cdot \frac{}{11} \cdot \frac{}{2}$

52. $4 \cdot 2 \cdot \frac{1}{2} \cdot \frac{4}{1} \cdot \frac{5}{2 \cdot 1 \cdot 2} \cdot \frac{2 \cdot 2 \cdot 5}{10}$

$\frac{3}{1}\cdot\frac{14}{1}=\frac{3\cdot 14}{1\cdot 1}=\frac{3\cdot 2\cdot 7}{1\cdot 1}=\frac{2}{1}=2$

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

53. $\frac{1}{3}\cdot\frac{9}{1}\cdot\frac{10}{3}=\frac{3\cdot 3\cdot 2\cdot 5}{1\cdot 3\cdot 1}=30$

2 15 2 ·15 15

43. $\frac{3}{8}\ \frac{12}{17}\ \frac{3\cdot 12}{8\cdot 17}\ \frac{3\cdot 2\cdot 2\cdot 3}{2\cdot 2\cdot 2\cdot 17}\ \frac{9}{34}$

Objective B Exercises

44. $4\frac{3}{8}\ \frac{4\cdot 3}{1\cdot 8}\ \frac{2\cdot 2\cdot 3}{1\cdot 2\cdot 2}\ \frac{3}{2}\ 1\frac{1}{2}$

54. $\frac{1}{2}\ \frac{7}{3}\ \frac{15}{7}\ \frac{3}{1}\ \frac{3\cdot 5\cdot 3}{7\cdot 1}\ \frac{45}{6}\ \frac{3}{7}\ \frac{7}{7}$

55. $\frac{1}{4}\ 8\ \frac{21}{4}\ \frac{8}{1}\ \frac{3\cdot 7\cdot 2\cdot 2}{2\cdot 2\cdot 1}\ 42$

56. $\frac{2}{3}\ 5\frac{11}{3}\ \frac{5}{1}\ \frac{11\cdot 5}{3\cdot 1}\ \frac{55}{3}\ 18\frac{1}{3}$

57. $4\frac{2}{9}\ \frac{3}{1}\ \frac{38}{9}\ \frac{3}{1}\ \frac{2\cdot 19\cdot 3}{3\cdot 3\cdot 1}\ \frac{38}{12}\ \frac{2}{3}$

58.

59.

60.

61.

62.

63.

64.

65.

66.

69.

70.

71.

72.

The height is $3\frac{1}{2}$ inches.

73.

The distance is 54 metres.

True

75.

2 5 2
5 2 ·5

1
1

1 1 1 1

67. 5 3 5 1 83 16 83·2· 2·2·2

16 3 16 3 2·2·2·2·3

1 1 1 1

1 1

76. 4 3 3 3 35 18 5·7 ·2·3·3

8 5 8 5 2·2 ·2 ·5

1 1

83 27 2

3 3

1 1
5

1 1 26 40 2·1/3·2·2·2·5
17
68. 5 3 16

5 13 5 13 5·1/3
1 1

63 15 3

4 4

1
77. 2 1 5 17 5 5

8 17 8

22217 8

1

78. 12 2 3 7 62 100

5 31 5 31

1/ 1
2 ·31·2 ·2
·5·5
5· 3/1
1 1

40

79. $1\frac{3}{8} \quad 2\frac{1}{5} \quad \frac{11}{8} \quad \frac{11}{5} \quad \frac{121}{40} \quad 3\frac{1}{40}$

80. $3\frac{1}{8} \quad 2\frac{4}{7} \quad \frac{25}{8} \quad \frac{18}{7} \quad \frac{5\cdot 5\cdot 2\cdot 3\cdot 3}{2\cdot 2\cdot 2\cdot 7} \quad \frac{225}{28} \quad 8\frac{1}{28}$

Objective C Exercises

Less than \$35, because $2\frac{3}{4} \quad 3$

Less than 4 feet, because $\frac{1}{3}$ of 9 feet is approximately 3 feet; therefore, $\frac{1}{3}$ of $9\frac{1}{4}$ feet is approximately 3 feet.

Strategy To find the cost of the salmon, multiply the amount of salmon $2\frac{3}{4}$ kilograms by the cost per kilograms (\$12).

Solution $2\frac{3}{4} \quad 12 \quad \frac{11}{4} \quad \frac{12}{1} \quad \frac{11\cdot 4\cdot 3}{4\cdot 1} \quad 33$

The salmon costs \$33.

Strategy To find how far a person can walk in $\frac{1}{3}$ hour, multiply the distance walked in 1 hour $2\frac{1}{2}$ kilometres by $\frac{1}{3}$.

Strategy To find the length cut, multiply the length of the board $9\frac{1}{4}$ feet by $\frac{1}{3}$.

Solution $\frac{1}{3} \quad 9\frac{1}{4} \quad \frac{1}{1} \quad \frac{37}{3} \quad \frac{37}{4} \quad \frac{1\cdot 37}{3\cdot 4} \quad \frac{37}{12} \quad 3\frac{1}{12}$

The length of the board cut off is $12\frac{1}{2}$ feet.

Strategy To find the perimeter of the square, multiply the length of 1 side $16\frac{1}{4}$ centimetres by 4.

Solution $16\frac{1}{2} \quad 4 \quad \frac{33}{2} \quad \frac{4}{1} \quad \frac{33\cdot 2}{1} \quad 66$

The perimeter of the square is 66 centimetres.

Strategy To find the area of the square, multiply the length of one side $5\frac{1}{2}$ metres by itself $5\frac{1}{2}$ metres.

Solution $5\frac{1}{2} \quad 5\frac{1}{2} \quad \frac{11}{2} \quad \frac{11}{2}$

Chapter 2 Fractions 2-

11 · 11 121

Solution $2\frac{1}{2}\ \frac{1}{3}\ \frac{5}{2}\ \frac{1}{3}\ \frac{51}{23}\ \frac{5}{6}$

A person can walk $\frac{5}{6}$ kilometres in $\frac{1}{3}$ hour.

$2 \cdot 2 \quad 4$

$\frac{1}{4}$

30

The area of the square is $30\frac{1}{4}$ square metres .

Strategy To find the area of the rectangle, multiply the length by the width.

Solution $4\frac{2}{5} \cdot 3\frac{3}{10} = \frac{22}{5} \cdot \frac{33}{10}$

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

$= \frac{363}{25} = 14\frac{13}{25}$

The area of the rectangle is $14\frac{13}{25}$ square centimetres.

Strategy To find the number of acres turned into ethanol, multiply the total number of acres planted each year (3 million) by $\frac{6}{10}$.

Solution $3 \cdot \frac{6}{10} = \frac{3}{1} \cdot \frac{6}{10} = \frac{36}{110} = \frac{18}{10} = \frac{9}{5} = 1\frac{4}{5}$

$1\frac{4}{5}$ million acres of corn are turned into ethanol each year.

90. $6\frac{1}{2} \times \frac{3}{8} = \frac{13}{2} \cdot \frac{3}{8} = \frac{39}{16} = 2\frac{7}{16}$

The weight of the $6\frac{1}{2}$-foot steel rod is $2\frac{7}{16}$ pounds.

91. 12 7 4 1 151 13 1963 54 19

92. 5 1 69 5 345 25
8 1 10
8 4 8 4 32 32

3 1 43 5 215 7
10 4 2 2 4 2 8 26 8

10 25 26 7 10 25 26 28
32 8 32 32
53 21

36 32 37 32
21

The total weight is $37\frac{21}{32}$ pounds.

Strategy To find the total cost of the capes, multiply the amount of material each cape requires by the cost of 1 yard and by the number of capes needed.

Solution $1\frac{1}{2}$ 1222 $\frac{3}{2}$ 1222

$\frac{31222}{2}$

$\frac{792}{2}$ 396

The total cost is $396.

94. **Strategy** To find the distance from the wall to the centre of the drain, multiply the distance of the front face of the cabinet from the wall $23\frac{1}{2}$ inches by $\frac{1}{2}$.

Solution $23\frac{1}{2} \cdot \frac{1}{2} = \frac{47}{2} \cdot \frac{1}{2}$

$\frac{471}{2 \cdot 2}$ $\frac{47}{}$

12 3 12 3 36 36

The weight of the $12\frac{7}{12}$-foot steel rod is

22 4

$\frac{3}{4}$

$54\frac{19}{36}$ pounds.

The distance is $11\frac{3}{4}$ inches.

Critical Thinking

95. $\frac{1}{2}$; Any number multiplied by 1 is the number.

96. Student explanations should include the idea that every 4 years we must add 1 day to the usual 365-day year.

97. *A*. The product of any two positive rational numbers, each less than 1, is less than either of the two numbers.

Projects or Group Activities

98. $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{9}$

$1\frac{1}{9}$ $\frac{1}{6}$ $1\frac{1}{2}$

$2\frac{1}{4}$ $\frac{5}{18}$ $\frac{4}{9}$

More than one answer is possible.

Section 2.7

Concept Check

$\frac{7}{3}$

$\frac{1}{7}$

$4\frac{5}{}$

6

5. $\frac{3}{8}$ $\frac{4}{9}$ $\frac{3}{8}\frac{9}{4}$ $\frac{27}{32}$

Objective A Exercises

7. $\frac{1}{3}$ $\frac{2}{5}$ $\frac{1}{3}\frac{5}{2}$ $\frac{1\cdot5}{3\cdot2}$ $\frac{5}{6}$

8. $\frac{3}{7}$ $\frac{3}{2}$ $\frac{3}{7}\frac{2}{3}$ $\frac{3\cdot2}{7\cdot3}$ $\frac{2}{7}$

9. $\frac{3}{7}$ $\frac{3}{7}$ $\frac{3}{7}\frac{7}{3}$ $\frac{3\cdot7}{7\cdot3}$ 1

0 $\frac{1}{2}$ 0 0 2 1

0 $\frac{3}{4}$ 0 $\frac{4}{3}$ 0 3

12. $\frac{16}{33}$ $\frac{4}{11}$ $\frac{16}{33}$ $\frac{11}{4}$ $\frac{2\cdot2\cdot2\cdot2\cdot11}{3\cdot11\cdot2\cdot2}$ $\frac{4}{3}$ $1\frac{1}{3}$

$\frac{5}{24}$ $\frac{15}{36}$ $\frac{5}{24}$ $\frac{36}{15}$ $\frac{5\cdot2\cdot2\cdot3\cdot3}{2\cdot2\cdot2\cdot3\cdot3\cdot5}$ $\frac{1}{2}$

14. $\frac{11}{15}$ $\frac{1}{12}$ $\frac{11}{15}$ $\frac{12}{1}$ $\frac{11\cdot2\cdot2\cdot3}{3\cdot5}$ $\frac{44}{5}$ $8\frac{4}{5}$

15. $\frac{1}{9}$ $\frac{2}{3}$ $\frac{1}{9}\frac{3}{2}$ $\frac{3}{3\cdot3\cdot2}$ $\frac{1}{6}$

16. $\frac{10}{21}$ $\frac{5}{7}$ $\frac{10}{21}\frac{7}{5}$ $\frac{2\cdot5\cdot7}{3\cdot7\cdot5}$ $\frac{2}{3}$

17. $\frac{2}{5}$ $\frac{4}{7}$ $\frac{2}{5}\frac{7}{4}$ $\frac{2\cdot7}{5\cdot2\cdot2}$ $\frac{7}{10}$

No

18.

$$5 - \frac{3}{12}$$

$$3 \cdot 2 \cdot 2 \cdot 3$$

$$\frac{9}{8} - \frac{12}{8}$$

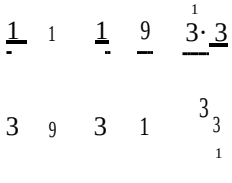
$$\frac{5}{2 \cdot 2 \cdot 2 \cdot 5}$$

$$\frac{10}{10}$$

$$\frac{1}{1}$$

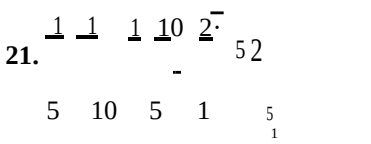
$$\frac{1}{1}$$

19. $\frac{1}{2} \cdot \frac{1}{4} \cdot \frac{1}{2} \cdot \frac{4}{1} \cdot \frac{1}{2} \cdot 2$

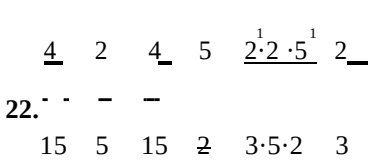


20.

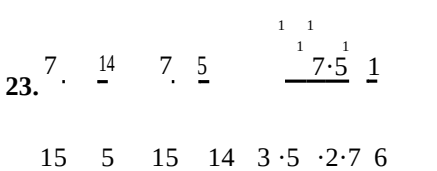
21.



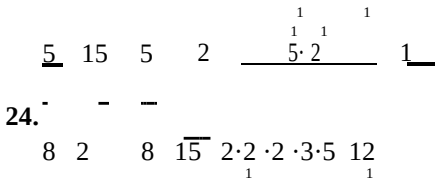
22.



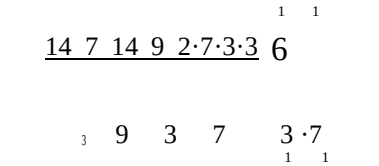
23.



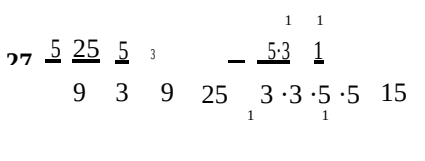
24.



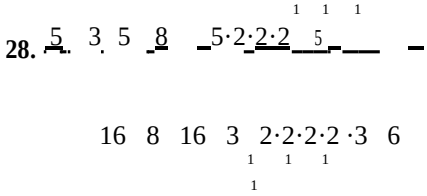
26.

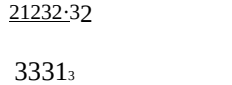


27.



28.





33.

34.

35.

36.

37.

38.

True
True

Objective B Exercises

42.

1 1

30. 4 1 _4 9 2·2·3·3 4

3 3 - 4 3·2·2 6

1

9 1 3·3

9

9

1 1

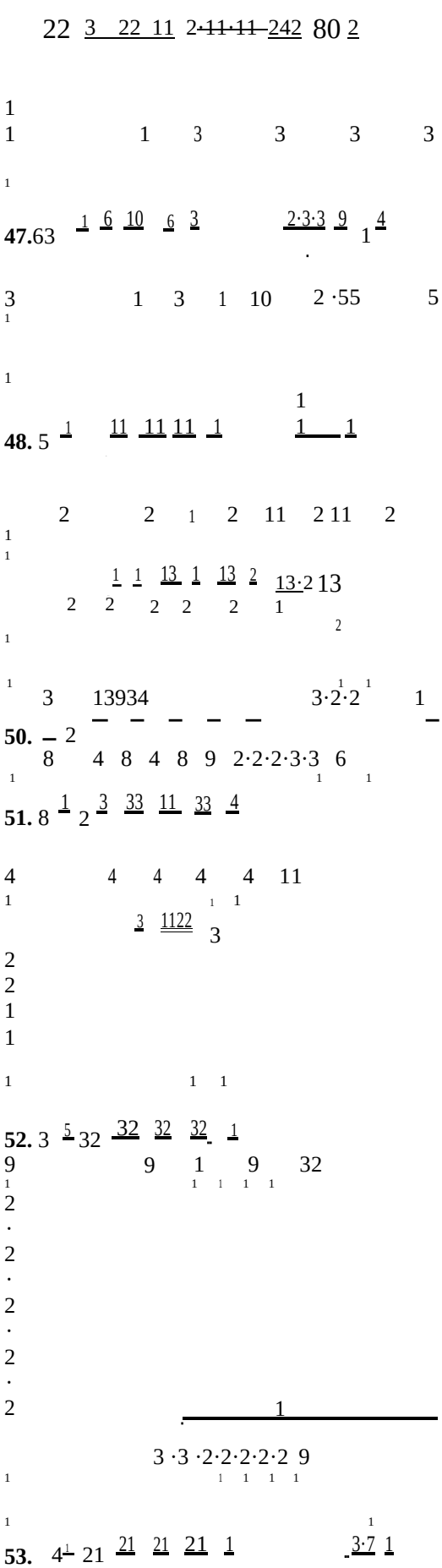
43.

31.

44.

32.

45.



56. 731 7137 4

8 4 8 4 8 13

7 · 2 · 2 7

2 · 2 · 2 · 13 26

35 735 24 5·7·2·2·2·3 120

24 1 7 7

58. 3 3 3 11 3 4

8 4 8 4 8 11

3·2·2 3

2 · 2 · 2 · 11 22

59. 11 2 11 20 11 9

18 9 18 9 18 20

11·3·3 11

2 · 3 · 3 · 2 · 2 · 5 40

2133 21 33 21 10

40 10 40 10 40 33

3·7·2·5 7

2·2 · 2 · 5 · 3 · 11 44

21213353 32

16 2 16 2 16 5

3·11·2 33

2·2 · 2 · 2 · 5 40

731738 19 3812

5 12 5 12 5 19

2 19 2 2 3 24

5 19 5

55. $\frac{11}{12} \cdot 2\frac{1}{3} \cdot \frac{11}{12} \cdot \frac{7}{3} \cdot \frac{11}{12} \cdot \frac{3}{7}$

$\frac{11}{12} \cdot \frac{7}{3} \cdot \frac{11}{12} \cdot \frac{3}{7}$

$\frac{11 \cdot 3 \cdot 11}{2 \cdot 2 \cdot 3 \cdot 7}$

$\frac{121}{28}$

$4\frac{4}{5}$

63. $1\frac{2}{3} \cdot 5\frac{3}{8} \cdot 5\frac{8}{3}$

$\frac{5 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 40}{3 \cdot 8 \cdot 3 \cdot 3}$

$4\frac{4}{9}$

64. 16 2 16 3 2·2 ·2·2 ·3 24
3 1 2 2

65. 1 5 4 13 4 13 1
8 8 1 8 4
13
2·2·2·2·2 32

3 1 107 4 107·2·2
66. 13 8 4 8 1 2·2·2

53 1
2 2

67. 16 1 1 16 3 16 2 2·2·2·2·2
2 2 1 3 3
32 2
3 10 3

68. 9 7 9 7 9 8 3·3·2·2·2
8 1 8 1 7 7
72 10 2
7 7

69. 1 1 5 8 4 53 4 9
3 9 3 9 3 53

2·2·3·3 12
3 ·53 53

133 2 0

Division by zero is undefined.

82 3 19 14 13 191 4 13 10
5 10 5 10 5 191

7·59·2·5 826 4 62
5 ·191 191 191

73. 102 1 1 102 3 102 2
1 2 1 2 1 3
2·3·17· 2 68
3

03 1 20 7 02

75. 8 2 1 58 1 58 1 58 8 2
7 7 7 7 7

6 9 13105 35 105 32
16 32 16 32 16 35

3 ·5·7 ·2 ·2 ·2 ·2 ·2 6
2 ·2 ·2 ·2· 5· 7

77. 8 8 2 13 80 49 80 18
9 18 9 18 9 49
2·2·2·2·5·2·3·3
3·3·7 ·7
3 13
4949

10117 5117 5110
5 10 5 10 5 17
3·17·2·5 6
5·1/7

79. 73127 59 59 9 32

8 32 8
32 8 59
/ 1 1 1 1
5
9·
2·
2·
2·
2·
2
4
2· 2· 2· 5/9
1 1 1 1
7 5 70 35 70 6
80.7 5

72. $45\frac{3}{5} \cdot 15 \cdot \frac{228}{5} \cdot \frac{15}{1} \cdot \frac{228}{5} \cdot \frac{1}{15}$

$\frac{2 \cdot 2 \cdot 3 \cdot 19}{5 \cdot 3 \cdot 5} \cdot \frac{76}{25} \cdot 3\frac{1}{25}$

$\frac{9}{4} \cdot \frac{6}{32} \cdot \frac{9}{4} \cdot \frac{6}{32} \cdot \frac{9}{4} \cdot \frac{35}{35}$

$\frac{2 \cdot 5 \cdot 7 \cdot 2 \cdot 3}{3 \cdot 3 \cdot 5 \cdot 7} \cdot \frac{4}{3} \cdot 1\frac{1}{3}$

81. $2\frac{3}{4} \cdot 1\frac{23}{32} \cdot \frac{11}{4} \cdot \frac{55}{32} \cdot \frac{11}{4} \cdot \frac{32}{35}$

$\frac{1 \cdot 1 \cdot 2 \cdot 2 \cdot 2 \cdot 8}{2 \cdot 2 \cdot 5 \cdot 1 \cdot 1} \cdot \frac{3}{5}$

82. $8\frac{1}{4} \quad 1\frac{5}{11} \quad \frac{33}{4} \quad \frac{16}{11} \quad \frac{33}{4} \quad \frac{11}{16}$

$\frac{3 \cdot 11 \cdot 11}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 64} \quad \frac{363}{43}$

$5\frac{43}{64}$

83. $\frac{14}{77} \quad 3\frac{1}{9} \quad \frac{14}{77} \quad \frac{28}{9} \quad \frac{14}{17} \quad \frac{9}{28}$

$\frac{2 \cdot 7 \cdot 3 \cdot 3}{17 \cdot 2 \cdot 2 \cdot 7} \quad \frac{9}{34}$

False

False

Objective C Exercises

86. Greater than 22, because $\frac{3}{4} \quad 1$

87. Less than 16, because $1\frac{1}{3} \quad 1$

88. Strategy To find how many boxes can be filled with 22 cups of cereal, divide 22 by the amount per box

$\frac{3}{4}$ cup.

Solution $22\frac{3}{4} \quad 22\frac{4}{3}$

$\frac{22 \cdot 4}{3} \quad \frac{88}{3} \quad 29\frac{1}{3}$

$29\frac{1}{2}$ boxes can be filled.

Solution $400 \quad 25\frac{3}{5} \quad 400 \quad \frac{128}{5}$

$400\frac{5}{128} \quad \frac{400 \cdot 5}{128}$

$\frac{2000}{128} \quad 15\frac{80}{128}$

$15\frac{5}{8}$

There are $15\frac{5}{8}$ servings in 400 grams of cereal.

Strategy To find the cost of a similar diamond weighing 1 karat, divide the cost of the purchased diamond ($1200) by its weight $\frac{5}{8}$ karat.

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

Solution $1200 \quad 81200 \quad 5$

$\frac{1200 \cdot 8}{5} \quad 1920$

The cost of a similar diamond weighing 1 karat is $1920.

Strategy To find the cost of each acre, divide the total cost ($200 000) by the number of acres $83\frac{1}{3}$.

Solution $200\,000 \quad 8\frac{1}{3} \quad 200000 \quad \frac{25}{3}$

$\frac{3}{1} \quad 200000 \quad \frac{25}{1}$

$200000 \cdot 3$

Strategy To find the

number of servings in 400 grams of cereal, divide 400 by the amount in each

25
24000

Each acre costs $24 000.

Chapter 2 Fractions 2-

serving $25\frac{2}{5}$ grams .

92. Strategy To find how many kilometres the car can travel on 1 litre of gasoline, divide the distance (440 kilometres) by the amount of gasoline used $47\frac{1}{2}$ litres.

Solution $440 \div 47\frac{1}{2} = \frac{440}{1} \div \frac{95}{2}$

$$\frac{440}{1} \cdot \frac{2}{95}$$

$$\frac{880}{95}$$

$$9\frac{65}{95} = 9\frac{13}{19}$$

The car can travel $19\frac{5}{19}$ kilometres on 1 gallon of gasoline.

Strategy To find the number of turns, divide the distance for the nut to move $4\frac{4}{5}$ centimetres by the distance the nut moves for each turn $\frac{2}{5}$ centimetres.

Solution $4\frac{4}{5} \div \frac{2}{5} = \frac{24}{5} \div \frac{2}{5}$

$$\frac{24}{5} \cdot \frac{5}{2}$$

$$\frac{24 \cdot 5}{5 \cdot 2}$$

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

The nut will make 12 turns in

94a. Strategy To find the number of acres, subtract the number of acres set aside $1\frac{1}{2}$ from the total number of acres $9\frac{3}{4}$.

Solution $9\frac{3}{4} = 9\frac{3}{4}$

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

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

$8\frac{1}{4}$ acres are available for housing.

b. Strategy To find the number of parcels, divide the number of acres available $8\frac{1}{4}$ by the number of acres in one parcel $\frac{1}{4}$.

Solution

$$8\frac{1}{4} \div \frac{1}{4} = \frac{33}{4} \div \frac{1}{4}$$

$$\frac{33}{4} \cdot \frac{4}{1}$$

$$\frac{33 \cdot 4}{4 \cdot 1} = 33$$

33 parcels of land can be sold.

95a. Strategy To find the total weight of the fat and bone, subtract the weight after trimming $3\frac{1}{4}$ kilograms from the original weight $5\frac{3}{4}$ kilograms.

$\frac{4}{5}$ moving $4\frac{4}{5}$ centimetres .

Solution $5\frac{3}{4} \quad 5\frac{9}{12}$

$4\frac{1}{4} \quad 4\frac{4}{12}$

$1\frac{5}{12}$

The total weight of the fat and $\frac{5}{}$

Chapter 2 Fractions 2-

b. Strategy To find the number of servings, divide the weight after trimming $\left(4\frac{1}{3}\text{ kilograms}\right)$ by the weight of one serving $\left(\frac{1}{3}\text{ kilogram}\right)$.

Solution $4\frac{1}{3} \div \frac{1}{3} = \frac{13}{3} \div \frac{1}{3} = \frac{13}{3} \cdot \frac{3}{1} = \frac{13 \cdot 3}{3 \cdot 1} = 13$

The chef can cut 13 servings from the roast.

Strategy To find the length of the remaining piece:

- Divide the total length (5 metres) by the length of each shelf $\left(1\frac{1}{6}\text{ metres}\right)$.
- Multiply the fraction left over by the length of one shelf.

Solution $5 \div 1\frac{1}{6} = 5 \div \frac{7}{6}$

$\frac{5}{1} \cdot \frac{6}{7} = \frac{5 \cdot 6}{7} = \frac{30}{7}$

$4\frac{2}{7}$

$\frac{2}{7} \cdot 1\frac{1}{6} = \frac{2}{7} \cdot \frac{7}{6} = \frac{2 \cdot 7}{7 \cdot 2 \cdot 3} = \frac{1}{3}$

97. Strategy To find the distance between each post:

- Find the total distance taken up by the five posts $\left(1\frac{1}{4}\text{ inches each}\right)$.
- Subtract that sum from the total distance between the posts $\left(22\frac{3}{4}\text{ inches}\right)$.
- Divide the remaining distance by 6, the number of spaces between each of the five inserted posts and the end posts.

Solution $5 \cdot 1\frac{1}{4} = \frac{5}{1} \cdot \frac{5}{4} = \frac{25}{4}$

$22\frac{3}{4} - \frac{25}{4} = \frac{91}{4} - \frac{25}{4} = \frac{66}{4}$

$\frac{66}{4} \div 6 = \frac{66}{4} \cdot \frac{1}{6} = \frac{66 \cdot 1}{4 \cdot 6}$

$\frac{11}{4} = 2\frac{3}{4}$

The distance between each post is $2\frac{3}{4}$ inches.

98. Strategy To find the distance between each post:

- Find the total distance taken up by the 10 posts $\left(1\frac{1}{2}\text{ inches each}\right)$.

The length of the remaining piece is $\frac{1}{3}$ metre.

Subtract that sum from the total distance between the posts $42\frac{1}{2}$ inches.

Divide the remaining distance by 11, the number of spaces between each of the ten

inserted posts and the

end posts.

Solution 10 1 1/2 10/1 3/2

10/1 3/2 15 15

1 2 1

42 1/2 15 85/2 15/1

85/2 30/2 55/2

55/2 11 55/2 1/11 551/2 11

5/2 2 1/2

The distance between each post is 2 1/2 inches.

Critical Thinking

99. 2/3 1/2 4/6 3/6 1/6

5520155
68242424

101. 1/2 3/5 5/10 6/10 11/10 1 1/10

23248
34339

106. 311 39/4 38/8 3222/4 8 4 9 2233 3

1 1 1

2

1 1 1

Strategy To find the bank-recommended maximum monthly house payment, multiply your monthly income ($4500) by 1/3.

Solution 4500 1/3 = 4500/3 = 1500

The bank would recommend that your maximum monthly house payment be $1500.

Strategy To find how much higher the grass plots were mowed for the study 3/20 inch than the more common heights used in tournaments 1/10 inch or 1/8 inch, subtract each of the shorter heights from the higher height.

Solution 3/20 1/10 3/20 2/20 1/20

3 1 6 5 1

102. $\frac{5}{9} - \frac{1}{6} = \frac{10}{18} - \frac{3}{18} = \frac{13}{18}$

103. $\frac{3}{4} - \frac{2}{3} = \frac{6}{12} - \frac{1}{12} = \frac{5}{12}$

104. $2\frac{5}{8} - 1\frac{2}{3} = \frac{21}{8} - \frac{5}{3} = \frac{63}{24} - \frac{40}{24} = \frac{23}{24}$

$\frac{20}{40} - \frac{8}{40} = \frac{40}{40} - \frac{40}{40}$

The grass plots in the study are $\frac{1}{20}$ inch or $\frac{1}{40}$ inch higher.

Strategy Multiply the length of one side (28 centimetres) by $\frac{1}{2}$ and multiply the thickness $\frac{7}{8}$ centimetre by 2.

Solution $\frac{1}{2}$ 28 = 14 centimetres on one side.

The thickness is $2\frac{7}{8} = \frac{7}{4} = 1\frac{3}{4}$ centimetres.

The other dimension (28 centimetres) remains the same.

The dimensions of the board when it is closed are 28 centimetres by 14 centimetres by $1\frac{3}{4}$ centimetres.

Strategy To find the number of miles:

Find out how many units of $\frac{1}{2}$ centimetre there are in $\frac{3}{10}$ centimetres.

Multiply by 60 kilometres.

3 1 43 2 43

Solution 4 units

102101 5

Then, because each unit represents 60 kilometres,

43 60 516

1 4 5 8 15 8

1 8 – 18 — — 17 —

2 5 10 10 10 10

$17\frac{7}{10}$ centimetres

Third, divide that space among the three columns.

$17\frac{7}{10} \div 3 = \frac{177}{10} \times \frac{1}{3} = \frac{177}{30} = 5\frac{27}{30}$

$5\frac{9}{10}$ centimetres

Projects or Group Activities

Internet Explorer: $\frac{9}{25}$

Firefox: $\frac{7}{25}$

Chrome: $\frac{9}{50}$

$\frac{9}{25} + \frac{7}{25} + \frac{9}{50} = \frac{18}{50} + \frac{14}{50} + \frac{9}{50} = \frac{41}{50}$

$\frac{41}{50}$ of the market

Safari: $\frac{3}{50}$

Opera: $\frac{1}{50}$

3 1 3 50

50 50 50 1 3

1

3 times more people

2

114. 9 2 9 2 9 billion, or

5 1

The distance is 516 kilometres.

$\blacksquare^{2}$ 1 25

First, find the spacing between the three columns.

$2\frac{2}{5}$ $2\frac{2}{5}$ $\frac{2}{5}$ $\frac{4}{15}$ centimetre

Second, find the remaining space for the columns.

360 000 000, or 360 million

115. $\frac{9}{50}$ $\frac{3}{50}$ $\frac{1}{50}$ $\frac{7}{25}$ $\frac{9}{25}$

$\frac{9}{50}$ $\frac{3}{50}$ $\frac{1}{50}$ $\frac{14}{50}$ $\frac{18}{50}$ $\frac{45}{50}$

$1\frac{45}{50}$ $\frac{50}{50}$ $\frac{45}{50}$ $\frac{5}{50}$ $\frac{1}{10}$

Section 2.8

Concept Check

Equal to

Greater than

Less than

(ii)

Objective A Exercises

11 19
40 40

92>19

103103

2 14,5 15,2 5

3 217 213 7

2=16,3=15,2>3

5 408 405 8

9. 5 15, 7 14,5 7

2412 248 12

11 = 33,17 = 34,11 < 17

48 2448 1624

7 28,11 33, 7 11

9 3612 369 12

5 = 25 7 = 28 5 < 7

60 1560 1215

13 52 19 57 13

19 36 144 48 144 36 48

4 5 is larger.

Objective B Exercises

18. $3^2 = 3 \cdot 3 = 9$

$8 \quad 8 \quad 64$

19. $5^2 = 5 \cdot 5 = 25$

$12 \quad 12 \cdot 12 = 144$

$2^3 = 2 \cdot 2 \cdot 2 = 8$

20. $9 \quad 9 \cdot 9 \cdot 9 = 729$

21. $\frac{1}{2} \cdot \frac{2}{3} \quad \frac{2}{2} \quad \frac{1}{2} \cdot \frac{2}{3} \quad \frac{2}{3} \cdot \frac{2 \cdot 2}{3 \cdot 3} \quad \frac{1}{2}$

$2 \quad 3 \quad 2 \quad 3 \cdot 3 \quad 2 \cdot 3 \cdot 3 = 9$

1

$\frac{2}{3} \cdot \frac{1}{3}^4 \quad \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3}$

22. $3^2 \quad 3 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

1

$2 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$

$3 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 24$

1

$1^2 \quad 3^3 \quad 1 \cdot 1 \quad 3 \cdot 3 \cdot 3$

23. $3 \quad 5 \quad 3 \cdot 3 \quad 5 \cdot 5 \cdot 5$

$1 \quad 1 \quad 1 \quad 1$

$1 \cdot 1 \cdot 3 \cdot 3 \cdot 3 = 3$

$3 \cdot 3 \cdot 5 \cdot 5 \cdot 5 = 125$

$1 \quad 1$

24. $\frac{2}{3} \cdot \frac{5}{2} \quad \frac{2}{2} \cdot \frac{2}{5} \cdot \frac{5}{5}$

13. $\frac{13}{14}, \frac{39}{42}, \frac{19}{21}, \frac{38}{42}, \frac{13}{14}, \frac{19}{21}$

14. $\frac{13}{18}, \frac{26}{36}, \frac{7}{12}, \frac{21}{36}, \frac{13}{18}, \frac{7}{12}$

15. $\frac{7}{24}, \frac{35}{120}, \frac{11}{30}, \frac{44}{120}, \frac{7}{24}, \frac{11}{30}$

$$\frac{5}{2\cdot 2\cdot 2\cdot 5\cdot 5}, \frac{7}{8}, \frac{5}{5\cdot 5\cdot 5\cdot 7\cdot 7}, \frac{5}{245}$$

25. $\frac{5^3}{25}, \frac{18^2}{9}, \frac{5}{9}, \frac{5}{9}, \frac{5}{9}, \frac{18}{25}, \frac{18}{25}$

$$\frac{5\cdot 5\cdot 5\cdot 2\cdot 3}{3\cdot 3\cdot 3\cdot 3\cdot 3\cdot 3\cdot 5\cdot 5\cdot 5\cdot 5}, \frac{3\cdot 2}{45}, \frac{3\cdot 3\cdot 4}{}$$

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

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

$\frac{3}{6} \cdot \frac{4}{6}$

$\frac{5}{6}$

27. $\frac{2}{5} + \frac{3}{10} \div \frac{2}{3} = \frac{4}{10} \cdot \frac{3}{10} \div \frac{2}{3}$

$\frac{7}{10} \cdot \frac{2}{3}$

$\frac{21}{30}$

$\frac{1}{30}$

28. $\frac{1}{3} \cdot \frac{1}{2} \div \frac{3}{4} \cdot \frac{1}{2} \div \frac{2}{3}$

$\frac{2}{3} \cdot \frac{3}{4}$

$\frac{8}{12} \cdot \frac{9}{12}$

$\frac{17}{12} = 1\frac{5}{12}$

29. $\frac{3}{7} \cdot \frac{14}{15} \div \frac{4}{5} \cdot \frac{2}{5} \div \frac{4}{5}$

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

$\frac{5}{5}$

$\frac{72478}{93591}$

$\frac{35}{45} \cdot \frac{24}{45}$

$\frac{11}{45}$

$\frac{51252}{883824}$

32. $\frac{3}{4} \cdot \frac{1}{2} \div \frac{2}{5} \cdot \frac{3}{4} \div \frac{4}{1} \cdot \frac{5}{1} \div \frac{2}{1} \cdot \frac{3}{1}$

$\frac{3}{3}$

$\frac{9}{15} \cdot \frac{5}{15}$

$\frac{4}{15}$

33. $\frac{5}{6} \cdot \frac{2}{3} \div \frac{3}{4} \cdot \frac{1}{2} \div \frac{6}{2} \cdot \frac{2}{4} \div \frac{3}{2}$

$\frac{3}{8}$

$\frac{10}{8} \cdot \frac{3}{8}$

$\frac{7}{8}$

34. $\frac{1}{3} \cdot \frac{3}{5} \div \frac{4}{9} \cdot \frac{1}{2} \div \frac{1}{3} \cdot \frac{2}{5} \div \frac{3}{9} \cdot \frac{1}{2}$

$\frac{4}{15} \cdot \frac{1}{2}$

$\frac{10}{30} \cdot \frac{8}{30} \cdot \frac{15}{30}$

$\frac{3}{30} \cdot \frac{1}{10}$

35. $\frac{7}{8} \cdot \frac{2}{3} \div \frac{1}{6} \cdot \frac{5}{8} \div \frac{7}{1} \cdot \frac{2}{1} \div \frac{1}{6} \cdot \frac{5}{6}$

$\frac{15}{21} \cdot \frac{2}{8} \cdot \frac{20}{24}$

$\frac{24}{17}$

24

24 24 24

33

24

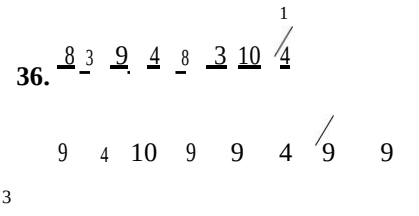
1 9

24

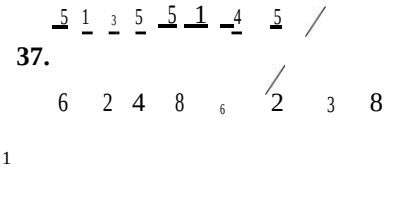
1 3

8

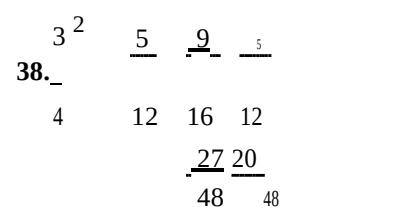
36.



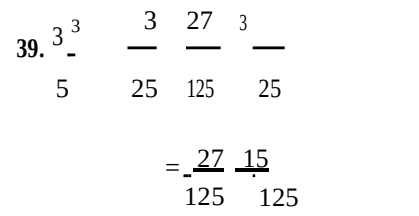
37.



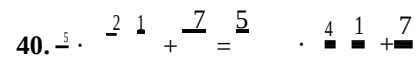
38.



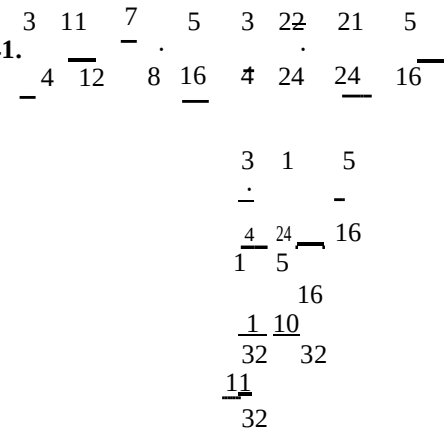
39.



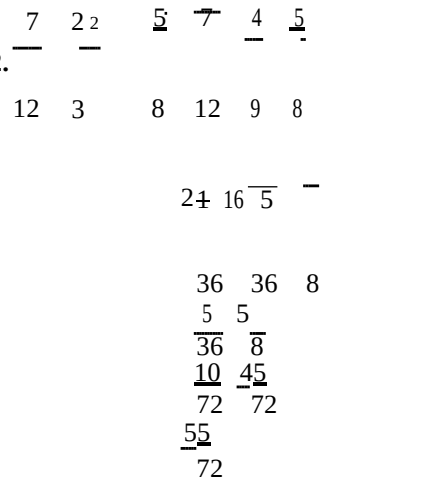
40.



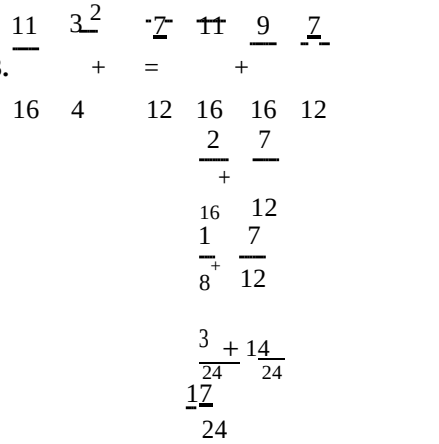
41.



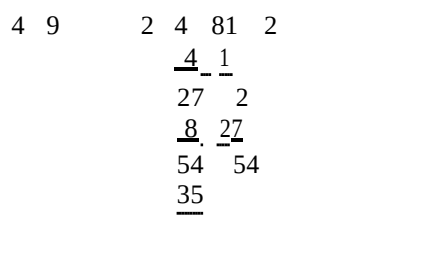
42.



43.



44.



6 3 6 18 6 6 6 18

$$= \frac{5}{6} \cdot \frac{3}{6} + \frac{7}{18}$$

$$= \frac{5}{12} + \frac{7}{18}$$

$$= \frac{15}{36} + \frac{14}{36}$$

$$= \frac{29}{36}$$

45. $\frac{9}{10} \cdot \frac{2^3}{3}$

$$\frac{54}{3} \cdot \frac{9}{10} + \frac{8}{27}$$

$$\frac{2}{3} \cdot \frac{4}{15}$$

$$\frac{4}{15} + \frac{10}{15}$$

$$\frac{14}{15}$$

46.

48.

49.

50.

51.

52.

53.

54.

$$\frac{8}{9}\cdot\frac{14}{64}=\frac{14}{9}\cdot\frac{1}{64}=\frac{7}{32}$$

$$\frac{8}{9}\cdot\frac{16}{64}=\frac{1}{9}\cdot\frac{16}{64}=\frac{4}{9}\cdot\frac{1}{64}=\frac{5}{64}$$

55. 5 3 1 5 3 2

2 2

6 4 2 6 4 4

1 2

6 4

5 1

6 16

40 3

48 48

43

48

56a. 2 5 3 3

9 6 4 5

b. 2 5 3 3

9 4 6 5

Critical Thinking

57a. 13 26 Location

50 100

1 25

Food Quality

4 100

More people choose location.

1 25 Food Quality

4 100

13 26 Location

50 100

16

Menu

100

2 8

Price

Projects or Group Activities

58. 7 2 1 5 7 2 3 5

8 3 2 6 8 3 6 6

2 8

3 6

1

7 2 8

8 3 6

3

8

9

64

72

127

72

55

72

7215 211615

8 32 6 24 242 6

371 5

242 6

5

6

40

48

77

48

29

48

7 2 1 5 7 2 1 5

60.

8 3 2 6 8 3 2 6

25 100

$\frac{12}{100}$ Speed

$\frac{3}{100}$ $\frac{3}{100}$ Other

The criterion that was cited by most people was location.

$\frac{7}{8} + \frac{1}{3} + \frac{5}{6}$

$\frac{21}{24} + \frac{8}{24} + \frac{20}{24}$

$\frac{49}{24}$

$2\frac{1}{24}$

Chapter 2 Review Exercises

30 2·3·5 2

45 3 ·3·5 3

2. 3 3 20 1 3 3 3 20 1

4 27 8 4 4 4 27 8

3332251

2222 2 2 3 3 3 8

5 1

16 8

5 2

16 16

3

16

13 4

44 11 4; 8·4 32

11·4 44

5. 11 44 , 17 51 , 11 17

18 72 24 72 18 24

6. 18 18 17 49

6 42 42

5 30 30

3 7 3 42 3 42

14 19

42

7. 5 1 3 2 15 8 3

7 8 3 5 7 24 24 5

2

7 3 1 3 1 5 5

7 24 5 12 5 12 3 36

10. 17 34

48

3 9

16 48

25

48

11. 8 2 2 3 26 13 26 5

3 5 3 5 3 13

265 213 5

3 13 3 13

3 3 1

3 3

12.

	2	3	5
20 =	2 · 2		5
48 =	2 · 2 · 2 · 2	3	

GCF $= 2 \cdot 2 = 4$

36 12 3; 2·12 24

3 ·12 36

14. 15 5 15 7 15 7 3 7 3

28 7 28 5 28·5 2·2·7·5 4

15. 2 12

18

15

18

2 4

9 18

1 13

18 18

1 1 9 22 9·22 3·3·2·11

16. 2 7 3 4 3 4 ·3 2·2 ·3

4

Chapter 2 Fractions 2-

$\frac{33}{16}\frac{1}{}$

8. $2\frac{1}{3}\ 3\frac{7}{8}\ \frac{7}{3}\ \frac{31}{8}\ \frac{7\cdot 31}{3\cdot 8}\ \frac{217}{24}\ 9\frac{1}{24}$

9. $1\frac{1}{3}\ \frac{1}{3}\ \frac{2}{3}\ \frac{4}{3}\ \frac{2}{3}\ \frac{4}{3}\ \frac{3}{3}\ \frac{4\cdot 3}{3\cdot 2}\ \frac{2\cdot 2\cdot 3}{3\cdot 2}\ 3\frac{2}{3}$

2 2

17.

	2	3
18 =	2	3 · 3
12 =	2 · 2	3 · 3

LCM $= 2 \cdot 2 \cdot 3 \cdot 3 = 36$

18. $\frac{16}{24} = \frac{2\cdot2\cdot2\cdot2}{2\cdot2\cdot11} = \frac{4}{11}$

$\frac{3}{8}$

$\frac{5}{8}$

$\frac{1}{8}$

$\frac{9}{8} = 1\frac{1}{8}$

20. $\frac{11}{50}\cdot\frac{25}{44} = \frac{11\cdot25}{50\cdot44} = \frac{11\cdot5\cdot5}{2\cdot5\cdot5\cdot2\cdot2\cdot11} = \frac{1}{8}$

$49\frac{4}{11} \quad 4\frac{24}{27} \quad 54$

$2\frac{1}{2} \quad 2\frac{1}{9}$

654

34

$11 \quad 27 \quad 11 \quad 54$

$17\frac{67}{54} \quad 18\frac{13}{54}$

22.

$15 =$	3	⑤
$25 =$		$5 \cdot 5$

$\text{GCF} = 5$

23. $\frac{3}{5}\overline{)17} \qquad \frac{17}{5} \quad \frac{2}{3} \quad \frac{5}{2}$

$\frac{15}{2}$

2

$4\frac{4}{5} \quad \frac{2}{3} \quad \frac{4}{5} \quad \frac{12}{5} \quad \frac{10}{3} \quad \frac{4}{15}$

$5 \quad 3^{2} \quad 15 \quad 15 \quad 15 \quad 2 \quad 15$

2

$\frac{2}{15} \quad \frac{4}{15} \quad \frac{2}{15} \quad \frac{2}{15} \quad \frac{4}{15}$

$\frac{4}{15} \quad \frac{15}{4} \quad \frac{4}{15} \quad \frac{15}{1}$

25. $\frac{3}{8} \quad \frac{9}{16}$

24

$13\frac{2}{3} \quad 1\frac{16}{24}$

$3\frac{5}{6} \quad 20\frac{3}{24}$

$4\frac{45}{24} \quad 5\frac{21}{24} \quad 5\frac{7}{8}$

26.

	2	3
$18 =$	②	$3 \cdot 3$
$27 =$		$3 \cdot 3 \cdot 3$

$\text{LCM} = 2 \cdot 3 \cdot 3 \cdot 3 = 54$

27. $\frac{11}{18}$

$\frac{5}{18}$

$\frac{6}{18} = \frac{1}{3}$

$\frac{5}{18} \quad \frac{14}{18} = \frac{5}{9} \quad \frac{19}{18}$

28. $27 \qquad 7 \qquad 7$

29. $\frac{5}{6}\cdot\frac{5}{12} = \frac{5\cdot12}{6\cdot5} = \frac{5\cdot2\cdot2\cdot3}{2\cdot3\cdot5} = 2$

30. $\frac{5}{12}\cdot\frac{4}{25} = \frac{5\cdot4}{12\cdot25} = \frac{5\cdot2\cdot2}{2\cdot2\cdot3\cdot5\cdot5} = \frac{1}{15}$

31. $16 \quad 15\frac{8}{8}$

$5\frac{7}{8} \quad 5\frac{7}{8}$

$10\frac{1}{8}$

$1\frac{7}{8}$

8

225 4 - 225 4 15

Strategy To find the total rainfall for the three months, add the amounts of rain from each month $\frac{1}{5}$, $6\frac{3}{10}$, and 8 centimetres.

2

Chapter 2 Fractions 2-51

Solution $5\frac{1}{2} \quad 5\frac{10}{20}$

$6\frac{3}{10} \quad 6\frac{6}{20}$

$\frac{8}{20}$

$19\frac{16}{20} \quad 19\frac{4}{5}$

The total rainfall for the three months was $19\frac{4}{5}$ centimetres.

Strategy To find the cost of each acre, divide the total cost ($168 000) by the number of acres $4\frac{2}{3}$.

Solution $168000 \div 4\frac{2}{3} \quad 168000 \div \frac{14}{3}$

$168000 \times \frac{3}{14}$

36000

The cost per acre was $36 000.

Strategy To find how many kilometres the second checkpoint is from the finish line:

Add the distance to the first checkpoint $4\frac{1}{2}$ kilometres to the distance between the first checkpoint and the second checkpoint $5\frac{3}{4}$ kilometres.

Subtract the total distance to the second checkpoint from the entire length of the race (15 kilometres).

The second checkpoint is $4\frac{3}{4}$ kilometres from the finish line.

Strategy To find how many kilometres the car can travel, multiply the number of kilometres the car can travel on 1 litre (9) by the number of litres used $6\frac{3}{4}$.

Solution $9 \quad 6\frac{3}{4} \quad 9\frac{27}{4}$

$\frac{27}{4} \quad \frac{243}{60} \quad \frac{3}{4}$

The car can travel $\frac{3}{4}$ kilometres.

Chapter 2 Test

1. $\frac{9}{11} \quad \frac{44}{81} \quad \frac{9 \cdot 44}{11 \cdot 81} \quad \frac{3 \cdot 3 \cdot 2 \cdot 2 \cdot 11}{11 \cdot 3 \cdot 3 \cdot 3 \cdot 3} \quad \frac{4}{9}$

2.

	2	3	5
$24 =$	$2 \cdot 2 \cdot 2$	3	
$80 =$	$2 \cdot 2 \cdot 2 \cdot 2$		5

$\text{GCF} = 2 \cdot 2 \cdot 2 = 8$

$5\frac{2}{5} \quad 7\frac{1}{3} \quad 5\frac{18}{10} \quad 5 \cdot 2 \cdot 3 \cdot 3 \quad \frac{10}{3}$

3. 91897 3·3·7 1 7 7
1 1

4.

3 2 2 5 1 3 3 4 5 1
4 3 6 12 4 4 6 6 12

Chapter 2 Fractions 2-52

Solution $4\frac{1}{4} \quad 4\frac{2}{4} \qquad\qquad 15\ 14\frac{4}{4}$

$5\frac{3}{4} \quad 5\frac{3}{4} \qquad\qquad 10\frac{1}{4} \quad 10\frac{1}{4}$

$9\frac{5}{4} \quad 10\frac{1}{4} \qquad\qquad 4\frac{3}{4}$

Chapter 2 Fractions 2-53

5.

7.

8.

9.

10.

$24 = 2 \cdot 2 \cdot 2 \cdot 3$

$40 = 2 \cdot 2 \cdot 2 \cdot 5$

$\text{LCM} = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 = 120$

11.

15.

16.

18.

11

Chapter 2 Fractions 2-54

1 6 32

1

1

24 4

12. $5\overline{)18}$ 3

$\frac{18}{5}$ $3\frac{3}{5}$

15

3

13. $6\frac{2}{3}$ $3\frac{1}{6}$ $\frac{20}{3}$ $\frac{19}{6}$ $\frac{20}{3}$ $\frac{6}{19}$

$\frac{2\cdot 2\cdot 5\cdot 2\cdot 3\cdot 40}{3\cdot 19}$ $\frac{2}{19}$ $\frac{2}{19}$

1

6 3

$\frac{96}{19}$ $\frac{96}{96}$

19. $\frac{7}{12}$

$\frac{11}{12}$

$\frac{5}{12}$

$\frac{23}{12}$ $1\frac{11}{12}$

$12\frac{5}{}$ $12\frac{25}{}$

12 60

9 17 9 51

60

21 76 22 16 22 4

606015

11

4

Strategy To find the electrician's earnings, multiply daily earnings ($240) by the number of days worked $3\frac{1}{2}$.

2

1 7

Solution 240 3 240

2 2

240·7 840

2

The electrician earns $840.

Strategy To find how many lots were available:

Find how many acres were being developed by subtracting the amount set

3

aside for the park 1 acres

4

from the total parcel

1

7 acres .

4

Divide the amount being developed by the size of each

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

2

Solution $7\frac{1}{2}$ $6\frac{5}{4}$

4 4

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

4 4

2 1

5 5

4 2

$5\frac{1}{2}\ \frac{1}{2}\ \frac{11}{2}\ \frac{2}{2}\ \frac{11}{1}\cdot\frac{2}{2}$ 11

11 lots were available for sale.

Strategy Multiply the numerical value of each measurement in inches by 2 and change the units to feet.

Solution Wall *a*:

1

1 25 2 25 2

6 2

4 4 1 4 1

2

25

2 12 $\frac{1}{2}$

The actual length of wall *a* is

1

Wall *b*: 9 2 18

The actual length of wall *b* is

feet.

Wall *c*:

1

7 7 2 63 2 63 2

8 8 1 8 1

4

63 3

4 15 4

The actual length of wall *c* is

$15\frac{3}{4}$ feet.

Strategy To find the total rainfall for the

Chapter 2 Fractions 2-56

3-month period, add the rainfall amounts for each of the months $11\frac{1}{2}$, 7, and $2\frac{7}{10}$ centimetres.

Chapter 2 Fractions 2-57

Solution $11\frac{1}{2} \quad 11\frac{5}{10}$

7 7

$2\frac{7}{10} \quad 2\frac{7}{10}$

$20\frac{12}{10} \quad 21\frac{1}{5}$

The total rainfall for the period was $21\frac{1}{5}$ centimetres .

Cumulative Review Exercises

290 000

9 9 13
810/ /10 317

390047
98769

278

926
79

8334
6482
73154

540 r12
57)30792

285
229
228
12

0

12

4·6361 4·361
1261
2 1

1

44

7.

	2	3	5	7
30 =	(2)	(3)	(5)	
42 =	2	3		(7)

LCM $= 2 \cdot 3 \cdot 5 \cdot 7 = 210$

8.

	2	3	5
60 =	(2 · 2)	3	(5)
80 =	2 · 2 · 2 · 2		5

GCF $= 2 \cdot 2 \cdot 5 = 20$

9. 2 21 2 23

3 7 3 3

25 1

10. 6 r1 4 6 4

4)25
24
1

11. 48 16 3; $\frac{5 \cdot 3}{16 \cdot 3}$ $\frac{15}{48}$

12. 24 2·2·2·3 2

1 1 1

60 2·2·3·5 5

1 1 1

13. 28

1
2 48
9 27

16 48
55 7
48 1 48

14. 7 42

2 22
2 11

3 8 3 48

5

2
0
7 7

12 48

2 15 24 5
16 48

1
0
7

1
1
.
2
.
1
1

1
5
.

4
4
2

Chapter 2 Fractions 2-58

12 48

22
24
3 9
8 24
13
24

14 4
8

— —

– —

—

16.

17.

18.

19.

20.

21.

22.

Solution

497

The amount in the chequing account was $862.

Strategy To find the total income from the sale of the tickets:

Find the income from the adult tickets by multiplying the ticket price ($11) by the number of tickets sold (87).

Find the income from the student tickets by multiplying the ticket price ($8) by the number of tickets sold (135).

Find the total income by adding the income from the adult tickets to the income from the student tickets.

Solution

The total income from the tickets was $2037.

Strategy To find the total weight, add the

three
weights.

$5\ \frac{4}{6}\qquad 5\ \frac{25}{6}.\ \frac{5\cdot 25}{6\cdot 4}\ \frac{125}{24}\ 5\frac{5}{24}$

$\frac{1}{2}\qquad \frac{12}{3}$

Strategy

To find
the

amount in the chequing account:

Find the total of the cheques written by adding the cheque amounts ($128, $54, and $315). Subtract the total of the cheques written from the original balance in the chequing account ($1359).

Chapter 2 Fractions 2-60

Solution 1 2 1 24

7 7 7 21

8 24

2 16

3 24

24 49 12 1 24

The total weight is

12 1 24 kilograms.

Chapter 2 Fractions 2-61

Strategy Subtract the length of the cut piece from the original length of the board.

Solution $2\frac{1}{10} \quad 2\frac{1}{10} \quad 1\frac{11}{10}$

$1\frac{1}{10} \quad 1\frac{5}{10} \quad 1\frac{5}{10}$

$\frac{2}{10} \quad \frac{10}{10} \quad \frac{10}{10}$

$\frac{6}{10} \quad \frac{3}{5}$

The length of the remaining piece is $5\frac{3}{10}$ metre.

27. Strategy To find how many kilometres the car can travel, multiply the number of litres used by the number of kilometres that the car travels on each litre (7).

Solution $7\ 8\frac{1}{2} \quad 7\frac{17}{2} \quad \frac{119}{2} \quad 59\frac{1}{2}$

The car travels $59\frac{1}{2}$ kilometres on $8\frac{1}{2}$ litres of gas.

Strategy To find how many parcels can be sold:

Find the amount of land that can be developed by subtracting the land donated for a park (2 acres) from the total amount of land purchased

$10\frac{1}{3}$ acres.

Divide the amount of land that can be developed by the size of each parcel $\frac{1}{3}$ acres.

Solution $10\ 3\frac{1}{3}$

$\frac{2}{1}$

3

$8\frac{1}{3} \quad \frac{1}{3} \quad \frac{25}{3} \quad \frac{1}{3} \quad \frac{25}{3} \quad 25$

$3 \quad 3 \quad 3 \quad 3 \quad 3 \quad 1$

25 parcels can be sold from the remaining land.

2 Fractions

Section 2.1: The Least Common Multiple and Greatest Common Factor

Objective 2.1A

To find the least common multiple (LCM)

New Vocabulary

multiples of a number
common multiple
least common multiple (LCM)

Discuss the Concepts

How can you find the multiples of 12?
How can you find some common multiples of 8 and 12?
Why is 24 the least common multiple of 8 and 12?

Concept Check

Find the LCM of 16, 20, and 40 by first listing the multiples of each number and then using the prime factorization method shown on page 68 of the textbook. **80**

Optional Student Activity

The ancient Mayans used two calendars, a civil calendar of 365 days and a sacred calendar of 260 days. If a civil year and the sacred year begin on the same day, how many civil years and how many sacred years will pass before this situation occurs again?

The LCM of 365 and 260 is 18 980.
18 980 ÷ 365 = 52
18 980 ÷ 260 = 73
The situation occurs again after 52 civil years and 73 sacred years.

Objective 2.1B

To find the greatest common factor (CGF)

Vocabulary to Review

factors of a number **[1.8A]**

New Vocabulary

common factor
greatest common factor (GCF)

Discuss the Concepts

How can you find the factors of 24?
How can you find the common factors of 12 and 24?
Why is 12 the greatest common factor of 12 and 24?

Concept Check

Find the product of the GCF of 225 and 444 and the LCM of 225 and 444.
GCF = 3; LCM = 33 300; 3(33 300) = 99 900

Concept Check

Find the GCF of $2^5 \cdot 3^9 \cdot 5^7$ and $2^7 \cdot 3^2 \cdot 5^4$.
$2^5 \cdot 3^2 \cdot 5^4 = 180000$

> **Optional Student Activity**
> What number must be multiplied by 200 so that the product has exactly 15 factors? **2; Factors: 1, 2, 4, 5, 8, 10, 16, 20, 25, 40, 50, 80, 100, 200, 400**

Section 2.2: Introduction to Fractions

Objective 2.2A

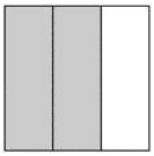
To write a fraction that represents part of a whole

New Vocabulary

fraction fraction
bar numerator
denominator
proper fraction
mixed number
improper fraction

Discuss the Concepts

Explain why the shaded portion of the diagram can be described as $\frac{2}{3}$.



Concept Check

Write a proper fraction and explain why it is a proper fraction.
Write a mixed number and explain why it is a mixed number.
Write an improper fraction and explain why it is an improper fraction.

Optional Student Activity

Use the symbol < , >, or = to compare each number with the number 1.

$\frac{3}{7}$ $\frac{3}{7} < 1$

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

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

Objective 2.2B

To write an improper fraction as a mixed number or a whole number, and a mixed number as an improper fraction

Vocabulary to Review

improper fraction **[2.2A]**
mixed number **[2.2A]**

Discuss the Concepts

Explain the procedure for rewriting an improper fraction as a mixed number or a whole number.

Explain the procedure for rewriting a mixed number as an improper fraction.

Concept Check

Match the equivalent mixed numbers and improper fractions.

1. $\frac{9}{2}$ **a.** $2\frac{7}{9}$

2. $\frac{25}{9}$ **b.** $2\frac{2}{9}$

3. $4\frac{19}{}$ **c.** $4\frac{1}{2}$

4. $4\frac{15}{20}$ **d.** $3\frac{3}{4}$

5. 9 **e.** $4\frac{3}{4}$

1. c 2. a 3. e 4. d 5. b

Section 2.3: Writing Equivalent Fractions

Objective 2.3A

To find equivalent fractions by raising to higher terms

Properties to Review

Multiplication Property of One **[1.4A]**

New Vocabulary

equivalent fractions

Discuss the Concepts

Explain the procedure for finding equivalent fractions.

Optional Student Activity

Divide two-thirds of a circle into sixths and write the equivalent fraction.
Divide one-third of a circle into ninths and write the equivalent fraction.
Divide three-fourths of a circle into eighths and write the equivalent fraction.
Divide one-fourth of a circle into twelfths and write the equivalent fraction.

1. $\frac{4}{6}$ **2.** $\frac{3}{9}$ **3.** $\frac{6}{8}$ **4.** $\frac{3}{12}$

Objective 2.3B

To write a fraction in simplest form

Vocabulary to Review

common factors **[2.1B]**

New Vocabulary

simplest form of a fraction

Discuss the Concepts

Explain the procedure for simplifying fractions.

Concept Check

Name the equivalent fractions in the list below. Then name the fractions that are written in simplest form.

$\frac{6}{8}$ 15 $\frac{9}{16}$ $\frac{3}{4}$ $\frac{18}{24}$

The equivalent fractions are $\frac{6}{8}$, $\frac{12}{16}$, $\frac{3}{4}$, and $\frac{18}{24}$. The fractions and $\frac{9}{16}$ are in simplest form.

Section 2.4: Addition of Fractions and Mixed Numbers

Objective 2.4A

To add fractions with the same denominator

Vocabulary to Review

numerator **[2.2A]**
denominator **[2.2A]**

Discuss the Concepts

Explain the procedure for adding two fractions with the same denominator.

Concept Check

Which of the following fractions, when added together, have a sum of 2?

$\frac{1}{9}, \frac{2}{9}, \frac{4}{9}, \frac{5}{9}, \frac{7}{9}$

$\frac{2}{9}$, $\frac{4}{9}$, $\frac{5}{9}$, and $\frac{7}{9}$

Objective 2.4B

To add fractions with different denominators

Vocabulary to Review

least common multiple (LCM) **[2.1A]**

New Vocabulary

least common denominator (LCD)

Discuss the Concepts

Explain why two fractions must have the same denominator before they can be added.

Optional Student Activity

Without calculating, decide which is greater. Explain your reasoning.

1. $\frac{1}{2}\ \frac{2}{3}$ or $\frac{1}{4}\ \frac{2}{5}$

2. $\frac{5}{6}\ \frac{4}{9}$ or $\frac{3}{8}\ \frac{3}{20}$

1. $\frac{1}{2} + \frac{2}{3}$

2. $\frac{5}{6} + \frac{4}{9}$

Explanations will vary. For example, in Exercise 1, $\frac{1}{2}$ $\frac{1}{4}$ and $\frac{2}{3}$ $\frac{2}{5}$ so the first expression must be greater than the second.

Objective 2.4C

To add whole numbers, mixed numbers, and fractions

Discuss the Concepts

Explain the steps involved in adding $3\frac{5}{6}$ and $4\frac{7}{12}$.

Concept Check

Find the sum of $1\frac{1}{2}$ $2\frac{1}{2}$ ... $19\frac{1}{2}$ $20\frac{1}{2}$.

The three dots mean that the pattern continues.

Optional Student Activity

In a magic square, the sums across, down, and diagonally are the same. Determine whether these squares are magic squares. **Yes**

1	$\frac{3}{8}$	$\frac{1}{2}$
$\frac{1}{8}$	$\frac{5}{8}$	$1\frac{1}{8}$
$\frac{3}{4}$	$\frac{7}{8}$	$\frac{1}{4}$

	2	$\frac{3}{4}$	1
	$\frac{1}{4}$	$1\frac{1}{4}$	$2\frac{1}{4}$
	$1\frac{1}{2}$	$1\frac{3}{4}$	$\frac{1}{2}$

Objective 2.4D

To solve application problems

Optional Student Activity

The following are the average portions of each day that a person spends for each activity.

Sleeping, $\frac{1}{3}$

Working, $\frac{1}{3}$

Personal hygiene, $\frac{1}{24}$

Eating, $\frac{1}{8}$

Rest and relaxation, $\frac{1}{12}$

Do these five activities account for an entire day? Explain your answer.

No. These activities account for only 22 hours.

Section 2.5: Subtraction of Fractions and Mixed Numbers

Objective 2.5A

To subtract fractions with the same denominator

Discuss the Concepts

Explain the procedure for subtracting two fractions with the same denominator.

What is the difference between the procedure for adding two fractions with the same denominator and the procedure for subtracting two fractions with the same denominator?

Concept Check

Which of the following fractions, when subtracted, have a difference of $\frac{2}{5}$?

$\frac{4}{5}, \frac{3}{5}, \frac{2}{5}, \frac{1}{5}$

$\frac{4}{5}$ and $5\frac{2}{}$, $5\frac{3}{}$ and $\frac{1}{5}$

> **Optional Student Activity**
> Use a diagram to illustrate and explain subtraction of two fractions with the same denominator.

Objective 2.5B

To subtract fractions with different denominators

Concept Check

Which expression is larger?

1. $\frac{11}{12} - \frac{2}{3}$ or $\frac{2}{3} - \frac{1}{8}$

2. $\frac{3}{5} - \frac{1}{3}$ or $\frac{9}{10} - \frac{7}{8}$

1. $\frac{2}{3} - \frac{1}{8}$ **2.** $\frac{3}{5} - \frac{1}{3}$

Objective 2.5C

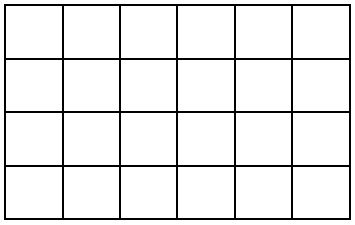
To subtract whole numbers, mixed numbers, and fractions

Discuss the Concepts

In subtraction of mixed numbers, when is borrowing necessary?

Optional Student Activity

Use the diagram below to illustrate the difference between 6 and $8\frac{1}{5}$.



Why does the figure have 24 squares? Would it be possible to illustrate the difference between $5\frac{1}{6}$ and 8 if there were 48 squares in the figure? What if there were 16 squares? Make a list of some of the possible numbers of squares that could be used to illustrate the difference between $6\frac{5}{8}$ and $8\frac{1}{6}$.

Objective 2.5D

To solve application problems

Optional Student Activity

A university final exam is $2\frac{1}{2}$ hours long. Complete the table below. Fill in the second column by calculating the test time remaining, given the time, in hours, that has already elapsed, which is shown in the first column.

Time Elapsed	*Time Remaining*
$\frac{1}{4}$	$2\frac{1}{4}$
$\frac{3}{4}$	$1\frac{3}{4}$
$1\frac{1}{2}$	1
$1\frac{3}{4}$	$\frac{3}{4}$
$2\frac{1}{4}$	$\frac{1}{4}$

Section 2.6: Multiplication of Fractions and Mixed Numbers

Objective 2.6A

To multiply fractions

Vocabulary to Review

product **[1.4A]**

Discuss the Concepts

Explain why you need a common denominator when adding or subtracting two fractions and why you don't need a common denominator when multiplying two fractions.

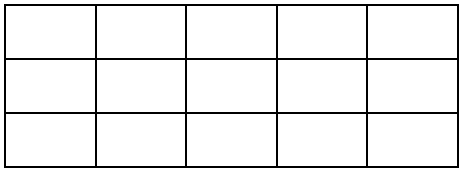
Concept Check

If two positive fractions, each less than 1, are multiplied, is the product always less than 1?

Yes

Optional Student Activity

Shade $3\frac{1}{2}$ of the diagram shown below.



b. Shade $\frac{2}{5}$ of the $3\frac{1}{2}$ of the diagram you already shaded.

c. Then use the diagram to find the product of $\frac{2}{5}$ and $3\frac{1}{2}$.

a. 5 of the 15 parts should be shaded.

b. 2 of the 15 parts should be shaded.

c. $\frac{2}{15}$

Objective 2.6B

To multiply whole numbers, mixed numbers, and fractions Discuss the Concepts

Describe the steps involved in multiplying $6\ 2\frac{1}{2}$ times 4.

Concept Check

Which expression results in the largest product? Which results in the smallest product?

$5\ 1\frac{1}{3} \times 2\ 8\frac{5}{}$

$6\ 7\frac{3}{} \times 2 5\frac{4}{}$

$4\frac{4}{} \times 2\ 1$ –

5 12

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

Part b is the largest product (18), and part c is the smallest product (10).

Optional Student Activity

Find two fractions evenly spaced between $\frac{3}{8}$ and $\frac{2}{5}$. **$\frac{23}{60}$ and $\frac{47}{120}$**

■ Objective 2.6C

To solve application problems

Optional Student Activity

You walk at a rate of $4\frac{2}{1}$ kilometres per hour. Complete the table below. Fill in the second column by calculating the distance walked in the number of hours shown in the first column.

Time Walking	*Distance Walked*
$1\frac{1}{2}$	**$\frac{3}{6}$ 4 9**
$2\frac{1}{2}$	**11 $\frac{1}{4}$**
$3\frac{1}{4}$	**14 $\frac{5}{8}$**

Section 2.7: Division of Fractions and Mixed Numbers

Objective 2.7A

To divide fractions

New Vocabulary

reciprocal of a fraction
inverting a fraction

Discuss the Concepts

Explain why we “invert and multiply” when dividing a fraction by a fraction.

Concept Check

Show by example that (1) the Commutative Property is not satisfied by division of fractions and (2) the Associative Property is not satisfied by division of fractions.

Answers will vary. For example:

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

$$\frac{1}{2} \div \frac{1}{4} \div \frac{1}{8} = 16$$

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

Optional Student Activity

Find the sum of the reciprocals of all the whole-number factors of 24.

$2\frac{1}{}$

Objective 2.7B

To divide whole numbers, mixed numbers, and fractions

Concept Check

(Note: This is a classic problem that students frequently miss.) What is 8 divided by one-half? **16**

Optional Student Activity

Shown below is the net weight of four different boxes of cereal. Find the number of $\frac{3}{4}$ -ounce servings in each box.

Kellogg Honey Crunch Corn Flakes: 24 ounces

Nabisco Instant Cream of Wheat: 28 ounces

Post Shredded Wheat: 18 ounces

Quaker Oats: 42 ounces

32 servings

$37\frac{1}{3}$ servings

24 servings

56 servings

(Note: For a two-step problem, ask students how many more $\frac{3}{4}$ -ounce servings are in a box of Quaker Oats than are in a box of Nabisco Cream of Wheat. The answer is $18\frac{2}{3}$ more servings.)

Objective 2.7C

To solve application problems

Concept Check

(Note: Example 9 and You Try It 9 on page 110 are difficult for students. Use the following problem if you have worked through these examples with your students and want to have them work through another, similar problem either on their own or in small groups.)

Optional Student Activity

A diet regime is formulated so that participants will lose $\frac{3}{4}$ kilogram per week. Complete the table below. Fill in the second column by calculating the number of weeks it will take a client to lose the amount of weight shown in the first column.

Kilograms to Lose	*Weeks to Lose Them*
6	8
10	**$13\frac{1}{3}$**
3	**4**
$8\frac{3}{4}$	**$11\frac{2}{3}$**

A 4-metre piece of wood molding is cut into pieces $1\frac{1}{2}$ metres long. What is the length of the piece that remains after as many pieces as possible have been cut? **$\frac{2}{3}$ metre**

Section 2.8: Order, Exponents, and the Order of Operations

Objective 2.8A

To identify the order relation between two fractions

Vocabulary to Review

number line **[1.1A]**
graph of a whole number **[1.1A]**

Discuss the Concepts

If two fractions have the same denominator, how can you determine which fraction is larger than the other?

If two fractions have different denominators, how can you determine which fraction is larger than the other?

Concept Check

Put the following fractions in order from smallest to largest.

$$\frac{17}{30}, \frac{7}{12}, \frac{8}{15}, \frac{17}{25}, \frac{5}{9}, \frac{13}{24}$$

$\frac{8}{15}, \frac{13}{24}, \frac{5}{9}, \frac{17}{30}, \frac{7}{12}, \frac{17}{25}$

Optional Student Activity

Use a diagram to show that $3\frac{2}{5}$ is greater than $3\frac{1}{2}$.

Objective 2.8B

To use the Order of Operations to simplify expressions

New Vocabulary

exponential expression

Procedures to Review

Order of Operations **[1.7A]**

Discuss the Concepts

In simplifying the expression

$$\frac{3}{4} - \frac{1}{2} + \frac{8}{9}$$

why can't you begin by adding $\frac{3}{4}$ and $-\frac{1}{2}$?

Optional Student Activity

Find the sum of the fraction halfway between $\frac{5}{4}$ and $\frac{3}{2}$ and the fraction halfway between $1\frac{1}{2}$ and $3\frac{1}{2}$. **$1\frac{3}{20}$**

Optional Student Activity

Find the product of

$$\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right)\left(1-\frac{1}{4^2}\right)\ldots\left(1-\frac{1}{9^2}\right)\left(1-\frac{1}{10^2}\right)$$

The dots mean that the pattern continues.

$\frac{11}{20}$