Pathways to College Mathematics 2nd edition Blitzer Solutions Manual

SKU: 9780135308530-SOLUTIONS

INSTRUCTOR'S SOLUTIONS MANUAL

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Niagara County Community College

PATHWAYS TO COLLEGE MATHEMATICS

SECOND EDITION

Robert Blitzer

Miami Dade College

Pearson

Pathways to College Mathematics 2nd edition Blitzer Solutions Manual



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ISBN-13: 978-0-13-527708-9
ISBN-10: 0-13-527708-6

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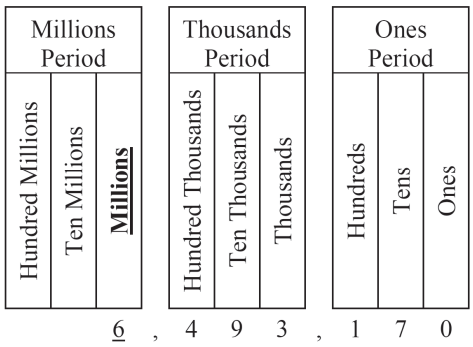
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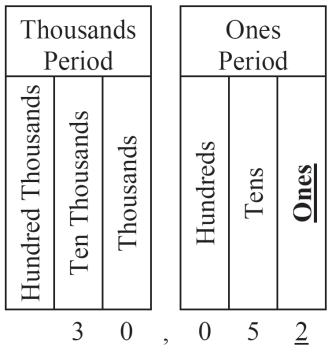
Chapter P
Prealgebra Pathways

Check Points P.1

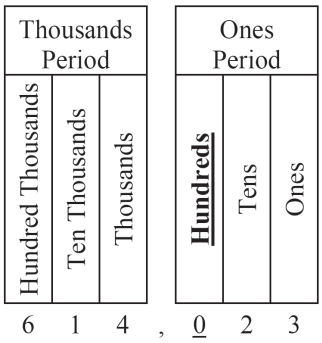
1. a. millions place



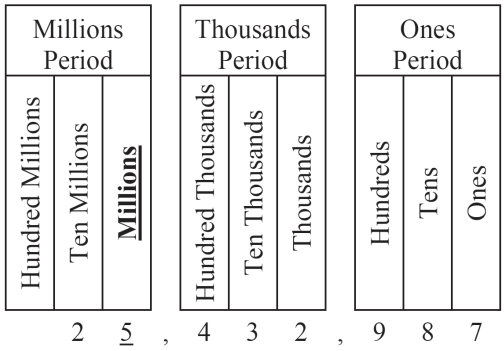
b. ones place



c. hundreds place



d. millions place



2. Work from left to right. Write the name of the three-digit number in each period, followed by the name of the period and a comma. Do not write the name of the last period, "ones."

a. twenty-seven thousand, one hundred forty-three

b. five hundred twenty-one million, six hundred thirty thousand, fifty-seven

3. a. Begin by noting how to write the number within each period.

$\overbrace{\text{fifty-three}}^{53}$ thousand, $\overbrace{\text{four hundred six}}^{406}$

Write the digits for the number in each period, followed by a comma.
The standard form for the number is 53,406.

b. Begin by noting how to write the number within each period.

$\overbrace{\text{two hundred four}}^{204}$ million, $\overbrace{\text{nine hundred thirty-two}}^{932}$ thousand, $\overbrace{\text{sixteen}}^{016}$

Write the digits for the number in each period, followed by a comma.
The standard form for the number is 204,932,016.

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4. a. The place value chart shows that 704,663 contains 7 hundred-thousands, 0 ten-thousands, 4 thousands, 6 hundreds, 6 tens, and 3 ones. Thus 704,663 is written in expanded form as follows: $704{,}663 = 700{,}000 + 4000 + 600 + 60 + 3$.

b. The place value chart shows that 49,063,400 contains 4 ten-millions, 9 millions, 0 hundred-thousands, 6 ten-thousands, 3 thousands, 4 hundreds, 0 tens, and 0 ones. Thus 49,063,400 is written in expanded form as follows: $49{,}063{,}400 = 40{,}000{,}000 + 9{,}000{,}000 + 60{,}000 + 3000 + 400$.

5. a. $14 > 5$ because 14 is to the right of 5 on the number line.

b. $0 < 16$ because 0 is to the left of 16 on the number line.

6. a. The digit to the right of the thousands digit is 4, which is less than 5. This indicates to leave the thousands digit the same. Replace all digits to the right with zeros.
$57{,}498 \approx 57{,}000$

b. The digit to the right of the hundred-thousands digit is 5. This indicates to add one to the hundred-thousands digit. Replace all digits to the right with zeros.
$4{,}856{,}902 \approx 4{,}900{,}000$

c. The digit to the right of the thousands digit is 6, which is greater than 5. This implies to add one to the thousands digit. Replace all digits to the right with zeros.
$9602 \approx 10{,}000$

d. The digit to the right of the millions digit is 2, which is less than 5. This implies to leave the millions digit the same. Replace all digits to the right with zeros.
$684{,}236{,}042 \approx 684{,}000{,}000$

7. a. The digit to the right of the billions digit is 5. This implies to add one to the billions digit. Replace all digits to the right with zeros.
$7{,}599{,}445{,}183 \approx 8{,}000{,}000{,}000$

b. The digit to the right of the ten-thousands digit is 5. This implies to add one to the ten-thousands digit. Replace all digits to the right with zeros.
$7{,}599{,}445{,}183 \approx 7{,}599{,}450{,}000$

c. The digit to the right of the thousands digit is 1, which is less than 5. This implies to leave the thousands digit the same. Replace all digits to the right with zeros.
$7{,}599{,}445{,}183 \approx 7{,}599{,}445{,}000$

8. a. The cost of a coronary bypass in the United States is $67,583

b. The country with the least amount in the CT scan column is India.
The average cost for this procedure in India is $43.

c. The charge for an appendectomy in Chile is $5509. The countries in which an appendectomy costs more than in Chile are Canada, Switzerland, and United States.

9. a. We begin with the number of marriages between an African-American husband and a white wife in 2010. Look at the bars labeled with the year 2010. The yellow bar to the right represents the number of marriages between an African-American husband and a white wife. The number above this bar is 390, representing 390 thousand. Thus, in 2010, there were 390,000 marriages between an African-American husband and a white wife.

b. Look for the red bar labeled 61 (for 61 thousand, or 61,000). This is the bar to the left for the year labeled 1990. Thus, in 1990, there were 61,000 marriages between a white husband and an African-American wife.

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Concept and Vocabulary Check P.1

1. whole; 0
2. standard
3. periods
4. millions; hundred-thousands; thousands; tens
5. millions; forty-two; nine
6. expanded; 5000; 60; 8
7. number line
8. <
9. >
10. 8; 5; add 1; 9,000,000
11. 2; 3; do not change; 8,542,000

Exercise Set P.1

Note that exercises #1 - 22 use the following table:

Millions Period			Thousands Period			Ones Period		
Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

1. hundreds
2. hundreds
3. ones
4. ones
5. hundred-thousands
6. hundred-thousands
7. millions
8. millions
9. ten-millions
10. ten-millions
11. hundred-millions
12. hundred-millions
13. two hundred fifty-eight
14. three hundred twenty-four
15. eight thousand, three hundred seventy-six
16. six thousand, two hundred twenty-six
17. thirty-six thousand, eight hundred eighty
18. fifty-two thousand, seven
19. seven million, five hundred sixty-six thousand
20. four million, three hundred two thousand
21. thirty-five million, two hundred sixty thousand, three hundred seventy-five
22. fifty-seven million, forty-four thousand, two hundred eight
23. The standard form is 3468.
24. The standard form is 5283.
25. The standard form is 86,500.
26. The standard form is 58,004.
27. The standard form is 16,402,012.
28. The standard form is 14,204,015.
29. The standard form is 9,000,009.
30. The standard form is 5,000,005.
31. The standard form is 26,034,203.
32. The standard form is 52,028,706.
33. The standard form is 620,595.
34. The standard form is 430,696.
35. The expanded form is $600 + 40 + 3$.
36. The expanded form is $500 + 70 + 2$.
37. The expanded form is $5000 + 40 + 6$.
38. The expanded form is $3000 + 50 + 7$.

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39. The expanded form is $80,000+1000+300+60+4$.

40. The expanded form is $70,000+2000+500+40+6$.

41. The expanded form is $50,000+5000+30+8$.

42. The expanded form is $40,000+4000+20+9$.

43. The expanded form is $20,000,000+8,000,000+600,000+40,000$.

44. The expanded form is $50,000,000+6,000,000+300,000+7000+30+2$.

45. $9>3$ because 9 is to the right of 3 on the number line.

46. $7>2$ because 7 is to the right of 2 on the number line.

47. $0<14$ because 0 is to the left of 14 on the number line.

48. $0<16$ because 0 is to the left of 16 on the number line.

49. $3600<4500$ because 36000 is to the left of 4500 on the number line.

50. $2300<3200$ because 2300 is to the left of 3200 on the number line.

51. $200,000>20,000$ because 200,000 is to the right of 20,000 on the number line.

52. $300,000>30,000$ because 300,000 is to the right of 30,000 on the number line.

53. 624 rounded to the nearest ten is 620.

54. 372 rounded to the nearest ten is 370.

55. 627 rounded to the nearest ten is 630.

56. 378 rounded to the nearest ten is 380.

57. 4891 rounded to the nearest hundred is 4900.

58. 5482 rounded to the nearest hundred is 5500.

59. 4831 rounded to the nearest hundred is 4800.

60. 5432 rounded to the nearest hundred is 5400.

61. 61,529 rounded to the nearest thousand is 62,000.

62. 72,503 rounded to the nearest thousand is 73,000.

63. 61,129 rounded to the nearest thousand is 61,000.

64. 72,103 rounded to the nearest thousand is 72,000.

65. 24,628 rounded to the nearest ten-thousand is 20,000.

66. 34,628 rounded to the nearest ten-thousand is 30,000.

67. 345,207 rounded to the nearest ten-thousand is 350,000.

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68. 645,308 rounded to the nearest ten-thousand is 650,000.

69. 86,609,100 rounded to the nearest million is 87,000,000.

70. 75,809,100 rounded to the nearest million is 76,000,000.

71. 86,409,100 rounded to the nearest million is 86,000,000.

72. 75,309,100 rounded to the nearest million is 75,000,000.

73. 86,609,100 rounded to the nearest ten-million is 90,000,000.

74. 75,809,100 rounded to the nearest million is 80,000,000.

75. ninety-two quadrillion, two hundred thirty-three trillion, seven hundred twenty billion, three hundred sixty-eight million, five hundred forty-seven thousand, eight hundred.

76. ten-quadrillions

77. $700,000,000,000 + 20,000,000,000$

78. $90,000,000,000,000,000 + 2,000,000,000,000,000$

79. 92,233,720,368,547,800 rounded to the nearest ten-quadrillion is 90,000,000,000,000,000.
The word name is ninety quadrillion.

80. 92,233,720,368,547,800 rounded to the nearest quadrillion is 92,000,000,000,000,000.
The word name is ninety-two quadrillion.

81. The greatest yearly earnings are for males with a Doctorate which is $131,569. In word form this is one hundred thirty-one thousand, five hundred sixty-nine dollars.

82. The least yearly earnings are for females with a 9^{th} to 12^{th} grade, non-graduate which is $16,812. In word form this is sixteen thousand, eight hundred twelve dollars.

83. Women with bachelor's degree earns $50,856. In word form this is fifty thousand, eight hundred fifty-six dollars.

84. Men with associate degree earns $51,865. In word form this is fifty-one thousand, eight hundred sixty-five dollars.

85. Men with bachelor's degree will earns $79,927 which would round to $80,000. In word form this is seventy-nine thousand, nine hundred twenty-seven dollars.

86. Women with master's degree will earns $64,834 which would round to $60,000. In word form this is sixty-four thousand, eight hundred thirty-four dollars.

87. In 1960 there were only 9,700,000 immigrants.

88. In 2016 there were 43,700,000 immigrants.

89. In 1900 there were only 10,300,000 immigrants.
In 1940 there were only 11,600,000 immigrants.
In 1960 there were only 9,700,000 immigrants.

90. In 1980 there were 14,100,000 immigrants.
In 2000 there were 31,100,000 immigrants.
In 2016 there were 43,700,000 immigrants.

91. In 1980 there were 14,100,000 immigrants.

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92. In 2000 there were 31,100,000 immigrants.

93. 2,376,206; two million, three hundred seventy-six thousand, two hundred six

94. 1,857,160; one million; eight hundred fifty-seven thousand, one hundred sixty

95. Williams

96. Brown and Jones

97. 1,857,160 rounded to the nearest hundred-thousand is 1,900,000.

98. 2,376,206 rounded to the nearest hundred-thousand is 2,400,000.

99. The 3 is in the ten-thousands place.

100. The 8 is in the ten-thousands place.

101. $1{,}380{,}145 < 1{,}534{,}042$

102. $1{,}857{,}160 > 1{,}380{,}145$

103. two thousand, four hundred fifty-three

104. two hundred two thousand, twenty-two

105. 102,063

106. 12,042

107. – 117. Answers will vary.

118. does not make sense; Explanations will vary. Sample explanation: Adding one to this number would create a bigger number.

119. makes sense

120. makes sense

121. makes sense

122. true

123. false; Changes to make the statement true will vary. A sample change is: The number 32,864 is written in standard form.

124. false; Changes to make the statement true will vary. A sample change is: When rounding whole numbers, the digit to be rounded either stays the same or increases by 1.

125. false; Changes to make the statement true will vary. A sample change is: When comparing numbers of various items, tables are just as effective as bar graphs.

126. The whole numbers from 10 to 40 would be rounded to 10 or 20 or 30 or 40. So there are four different rounded numbers.

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Check Points P.2

1. a. $\frac{3}{10}$ Numerator is 3. Denominator is 10.

b. $\frac{10}{3}$ Numerator is 10. Denominator is 3.

c. $\frac{\pi}{180^\circ}$ Numerator is π. Denominator is 180°.

2. a. There are 7 parts shaded out of a total 10 equal parts. Thus, the fraction $\frac{7}{10}$ (seven-tenths) represents the shaded portion of the figure.

b. There are 2 parts shaded out of a total 5 equal parts. Thus, the fraction $\frac{2}{5}$ (two-fifths) represents the shaded portion of the figure.

c. There are 13 parts shaded out of a total 16 equal parts. Thus, the fraction $\frac{13}{16}$ (thirteen-sixteenths) represents the shaded portion of the figure.

3. Fraction of fatal gun accidents with children between 15 and 34 is $\frac{\text{number of fatal gun accidents with children between 15 and 34}}{\text{total number of fatal gun accidents}}$.

$$= \frac{145+107}{606}$$

$$= \frac{252}{606}$$

4. a. $\frac{3}{10}$ Because the numerator is less than the denominator, $\frac{3}{10}$ is a proper fraction.

b. $\frac{10}{10}$ Because the numerator and denominator are equal, $\frac{10}{10}$ is an improper fraction.

c. $\frac{10}{3}$ Because the numerator is greater than the denominator, $\frac{10}{3}$ is an improper fraction.

5. a. Improper Fraction: Each whole object is divided into 3 equal parts, or thirds. A total of 5 of the thirds are shaded. The improper fraction $\frac{5}{3}$ represents the shaded portion of the group of figures.

Mixed Number: The shaded portions include 1 whole object and $\frac{2}{3}$ of a second object. The mixed number $1\frac{2}{3}$ represents the shaded portion of the group of figures.

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b. Improper Fraction: Each whole object is divided into 4 equal parts, or fourths. A total of 9 of the fourths are shaded. The improper fraction $\frac{9}{4}$ represents the shaded portion of the group of figures.

Mixed Number: The shaded portions include 2 whole object and $\frac{1}{4}$ of a second object. The mixed number $2\frac{1}{4}$ represents the shaded portion of the group of figures.

6. a. $2\frac{5}{8}=\frac{8\cdot 2+5}{8}=\frac{16+5}{8}=\frac{21}{8}$

b. $12\frac{7}{16}=\frac{16\cdot 12+7}{16}=\frac{192+7}{16}=\frac{199}{16}$

7. a. $\frac{5}{3}$ $\quad 3\overline{)5}$ $\quad \frac{3}{2}$

Write the mixed number using $\text{quotient}\frac{\text{remainder}}{\text{original denominator}}$. Thus, $\frac{5}{3}=1\frac{2}{3}$.

b. $\frac{86}{7}$ $\quad 7\overline{)86}$ $\quad \frac{7}{16}$ $\quad \frac{14}{2}$

Write the mixed number using $\text{quotient}\frac{\text{remainder}}{\text{original denominator}}$. Thus, $\frac{86}{7}=12\frac{2}{7}$.

c. $\frac{513}{19}$ $\quad 19\overline{)513}$ $\quad \frac{38}{133}$ $\quad \frac{133}{0}$

Write the mixed number using $\text{quotient}\frac{\text{remainder}}{\text{original denominator}}$. Thus, $\frac{513}{19}=27$.

Concept and Vocabulary Check P.2

1. numerator; denominator

2. 3; 8; $\frac{3}{8}$

3. proper; improper

4. mixed

5. 5; 3; 2; 5

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6. 2; 1

Exercise Set P.2

1. $\frac{5}{13}$ Numerator is 5. Denominator is 13.

2. $\frac{7}{19}$ Numerator is 7. Denominator is 19.

3. $\frac{13}{5}$ Numerator is 13. Denominator is 5.

4. $\frac{19}{7}$ Numerator is 19. Denominator is 7.

5. $\frac{\pi}{60}$ Numerator is π. Denominator is 60.

6. $\frac{\pi}{180}$ Numerator is π. Denominator is 180.

7. There are 3 parts shaded out of a total 5 equal parts. Thus, the fraction $\frac{3}{5}$ represents the shaded portion of the figure.

8. There are 2 parts shaded out of a total 5 equal parts. Thus, the fraction $\frac{2}{5}$ represents the shaded portion of the figure.

9. There is 1 part shaded out of a total 6 equal parts. Thus, the fraction $\frac{1}{6}$ represents the shaded portion of the figure.

10. There are 2 parts shaded out of a total 6 equal parts. Thus, the fraction $\frac{2}{6}$ represents the shaded portion of the figure.

11. There are 7 parts shaded out of a total 16 equal parts. Thus, the fraction $\frac{7}{16}$ represents the shaded portion of the figure.

12. There are 11 parts shaded out of a total 16 equal parts. Thus, the fraction $\frac{11}{16}$ represents the shaded portion of the figure.

13. a. Probability of landing on a red region $= \frac{\text{red region}}{\text{total regions}} = \frac{3}{10}$.

b. Probability of landing on a blue region $= \frac{\text{blue region}}{\text{total regions}} = \frac{2}{10}$.

c. Red is more likely.

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14. a. Probability of landing on a brown region $= \dfrac{\text{brown region}}{\text{total regions}} = \dfrac{3}{10}$.

b. Probability of landing on a yellow region $= \dfrac{\text{yellow region}}{\text{total regions}} = \dfrac{2}{10}$.

c. Brown is more likely.

15. $\dfrac{9}{11}$ Because the numerator is less than the denominator, $\dfrac{9}{11}$ is a proper fraction.

16. $\dfrac{8}{13}$ Because the numerator is less than the denominator, $\dfrac{8}{13}$ is a proper fraction.

17. c. $\dfrac{11}{9}$ Because the numerator is greater than the denominator, $\dfrac{11}{9}$ is an improper fraction.

18. c. $\dfrac{13}{8}$ Because the numerator is greater than the denominator, $\dfrac{13}{8}$ is an improper fraction.

19. $1\dfrac{2}{9}$ is a mixed number.

20. $1\dfrac{5}{8}$ is a mixed number.

21. $\dfrac{6}{6}$ Because the numerator and denominator are equal, $\dfrac{6}{6}$ is an improper fraction.

22. $\dfrac{8}{8}$ Because the numerator and denominator are equal, $\dfrac{8}{8}$ is an improper fraction.

23. Improper Fraction: $\dfrac{4}{3}$.

Mixed Number: $1\dfrac{1}{3}$.

24. Improper Fraction: $\dfrac{5}{3}$.

Mixed Number: $1\dfrac{2}{3}$.

25. Improper Fraction: $\dfrac{11}{4}$.

Mixed Number: $2\dfrac{3}{4}$.

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26. Improper Fraction: $\frac{5}{2}$.

Mixed Number: $2\frac{1}{2}$.

27. Improper Fraction: $\frac{17}{5}$.

Mixed Number: $3\frac{2}{5}$.

28. Improper Fraction: $\frac{18}{5}$.

Mixed Number: $3\frac{3}{5}$.

29. Improper Fraction: $\frac{25}{7}$.

Mixed Number: $3\frac{4}{7}$.

30. Improper Fraction: $\frac{26}{7}$.

Mixed Number: $3\frac{5}{7}$.

31. $2\frac{3}{8}=\frac{8\cdot 2+3}{8}=\frac{19}{8}$

32. $2\frac{7}{9}=\frac{9\cdot 2+7}{9}=\frac{25}{9}$

33. $7\frac{3}{5}=\frac{5\cdot 7+3}{5}=\frac{38}{5}$

34. $6\frac{2}{5}=\frac{5\cdot 6+2}{5}=\frac{32}{5}$

35. $8\frac{7}{16}=\frac{16\cdot 8+7}{16}=\frac{135}{16}$

36. $9\frac{5}{16}=\frac{16\cdot 9+5}{16}=\frac{149}{16}$

37. $12\frac{18}{25}=\frac{25\cdot 12+18}{25}=\frac{318}{25}$

38. $15\frac{21}{25}=\frac{25\cdot 15+21}{25}=\frac{396}{25}$

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39. $\frac{23}{5} = 4\frac{3}{5}$

40. $\frac{47}{8} = 5\frac{7}{8}$

41. $\frac{76}{9} = 8\frac{4}{9}$

42. $\frac{59}{9} = 6\frac{5}{9}$

43. $\frac{711}{20} = 35\frac{11}{20}$

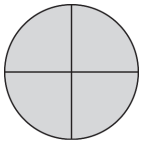
44. $\frac{788}{25} = 31\frac{13}{25}$

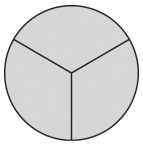
45. $\frac{1247}{43} = 29$

46. $\frac{1665}{37} = 45$

47. 

48. 

49. 

50. 

51. **a.** Shark attacks $= 24+14+3+2+1+1+1 = 46$

b. Florida had the greatest number of attacks, 24. Thus, the fraction of attacks that occurred in Florida is $\frac{24}{46}$.

c. Alabama, North Carolina, and Texas had one shark attack each. Thus, the fraction of attacks that occurred in these three states is $\frac{3}{46}$.

52. **a.** Shark attacks $= 24+14+3+2+1+1+1 = 46$

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b. Hawaii had the second greatest number of attacks, 14. Thus, the fraction of attacks that occurred in Hawaii is $\frac{14}{46}$.

c. South Carolina and California had a combined 5 shark attacks. Thus, the fraction of attacks that occurred in these two states is $\frac{5}{46}$.

53. – 58. Answers will vary.

59. does not make sense; Explanations will vary. Sample explanation: Since $\frac{3}{2}$ is an improper fraction the price would be higher than the original price.

60. makes sense

61. does not make sense; Explanations will vary. Sample explanation: There are 8 total people, so the denominator would be 8.

62. true

63. true

64. false; Changes to make the statement true will vary. A sample change is: A mixed number has a whole number and a proper fraction. $\frac{5}{4}$ is not a proper fraction.

65. false; Changes to make the statement true will vary. A sample change is: $\frac{17}{5} = 3\frac{2}{5}$.

Check Points P.3

1. a. $300 = 3 \cdot 100$
$= 3 \cdot 10 \cdot 10$
$= 3 \cdot 2 \cdot 5 \cdot 2 \cdot 5$
$= 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5$

b. $36 = 6 \cdot 6$
$= 2 \cdot 3 \cdot 2 \cdot 3$
$= 2 \cdot 2 \cdot 3 \cdot 3$

2. a. $\frac{10}{15} = \frac{2 \cdot \cancel{5}}{3 \cdot \cancel{5}} = \frac{2}{3}$

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b. $\frac{42}{24}=\frac{\cancel{2}\cdot\cancel{3}\cdot 7}{2\cdot 2\cdot\cancel{2}\cdot\cancel{3}}=\frac{7}{4}$

When reducing fractions, it may not be necessary to write prime factorizations.
We can use the greatest common factor to reduce this fraction.

$\frac{42}{24}=\frac{7\cdot\cancel{6}}{4\cdot\cancel{6}}=\frac{7}{4}$

c. $\frac{13}{15}$; Because 13 and 15 share no common factors (other than 1), $\frac{13}{15}$ is already reduced to its lowest terms.

d. $\frac{9}{45}=\frac{1\cdot\cancel{9}}{5\cdot\cancel{9}}=\frac{1}{5}$

3. a. $\frac{4}{11}\cdot\frac{2}{3}=\frac{4\cdot 2}{11\cdot 3}=\frac{8}{33}$

b. $6\cdot\frac{3}{5}=\frac{6}{1}\cdot\frac{3}{5}=\frac{18}{5}=3\frac{3}{5}$

c. $\frac{3}{7}\cdot\frac{2}{3}=\frac{3\cdot 2}{7\cdot 3}=\frac{6}{21}=\frac{2\cdot\cancel{3}}{7\cdot\cancel{3}}=\frac{2}{7}$

Remember that you can divide numerators and denominators by common factors before performing multiplication.

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

d. $\left(3\frac{2}{5}\right)\left(1\frac{1}{2}\right)=\frac{17}{5}\cdot\frac{3}{2}=\frac{51}{10}=5\frac{1}{10}$

4. a. $\frac{5}{4}\div\frac{3}{8}=\frac{5}{4}\cdot\frac{8}{3}=\frac{5}{\cancel{4}}\cdot\frac{\cancel{4}\cdot 2}{3}=\frac{10}{3}=3\frac{1}{3}$

b. $\frac{2}{3}\div 3=\frac{2}{3}\div\frac{3}{1}=\frac{2}{3}\cdot\frac{1}{3}=\frac{2}{9}$

c. $3\frac{3}{8}\div 2\frac{1}{4}=\frac{27}{8}\div\frac{9}{4}=\frac{27}{8}\cdot\frac{4}{9}=\frac{\cancel{9}\cdot 3}{\cancel{4}\cdot 2}\cdot\frac{\cancel{4}}{\cancel{9}}=\frac{3}{2}=1\frac{1}{2}$

5. a. $\frac{2}{11}+\frac{3}{11}=\frac{5}{11}$

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

c. $3\frac{3}{8}-1\frac{1}{8}=\frac{27}{8}-\frac{9}{8}=\frac{18}{8}=\frac{9}{4}=2\frac{1}{4}$

6. $\frac{2}{3}=\frac{2\cdot 7}{3\cdot 7}=\frac{14}{21}$

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7. a. $\frac{1}{2}+\frac{3}{5}=\frac{1\cdot 5}{2\cdot 5}+\frac{3\cdot 2}{5\cdot 2}=\frac{5}{10}+\frac{6}{10}=\frac{11}{10}$ or $1\frac{1}{10}$

b. $\frac{4}{3}-\frac{3}{4}=\frac{4\cdot 4}{3\cdot 4}-\frac{3\cdot 3}{4\cdot 3}=\frac{16}{12}-\frac{9}{12}=\frac{7}{12}$

c. $3\frac{1}{6}-1\frac{11}{12}=\frac{19}{6}-\frac{23}{12}=\frac{19\cdot 2}{6\cdot 2}-\frac{23}{12}$

$=\frac{38}{12}-\frac{23}{12}=\frac{15}{12}$

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

8. a.
$$\begin{array}{r} 17\frac{3}{7} \\ +10\frac{2}{7} \\ \hline 27\frac{5}{7} \end{array}$$

b.
$$\begin{array}{r} 15\frac{3}{16} \\ +20\frac{7}{16} \\ \hline \end{array}$$

$35\frac{10}{16}=35\frac{\cancel{2}\cdot 5}{\cancel{2}\cdot 8}=35\frac{5}{8}$

c.
$$\begin{array}{r} 16\frac{7}{12} \\ +2\frac{10}{12} \\ \hline \end{array}$$

$18\frac{17}{12}=18+1\frac{5}{12}=19\frac{5}{12}$

d.
$$\begin{array}{r} 24\frac{19}{23} \\ -16\frac{5}{23} \\ \hline 8\frac{14}{23} \end{array}$$

e.
$$\begin{array}{r} 18\frac{19}{20} \\ -\ 2\frac{4}{20} \\ \hline \end{array}$$

$16\frac{15}{20}=16\frac{\cancel{5}\cdot 3}{\cancel{5}\cdot 4}=16\frac{3}{4}$

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9. To subtract the fraction parts, we need to borrow from the number 8 because $\frac{5}{9}$ is less than $\frac{7}{9}$.

This is done as follows: $8\frac{5}{9} = \underbrace{7+1}_{8}\frac{5}{9} = 7+\frac{14}{9} = 7\frac{14}{9}$.

$$\begin{array}{r} 8\frac{5}{9} = \\ -3\frac{7}{9} = \\ \hline \end{array} \begin{array}{r} 7\frac{14}{9} \\ -3\frac{7}{9} \\ \hline 4\frac{7}{9} \end{array}$$

10. a. Using inspection, the least common denominator for the fraction parts is 35.

$$\begin{array}{r} 4\frac{2}{7} = \\ +\ 9\frac{11}{35} = \\ \hline \end{array} \begin{array}{r} 4\frac{2\cdot 5}{7\cdot 5} = \\ +9\frac{11}{35} \\ \hline \end{array} \begin{array}{r} 4\frac{10}{35} \\ +9\frac{11}{35} \\ \hline \end{array}$$

$$13\frac{21}{35} = 13\frac{\cancel{7}\cdot 3}{\cancel{7}\cdot 5} = 13\frac{3}{5}$$

b. Using inspection, the least common denominator for the fraction parts is 10.

$$\begin{array}{r} 26\frac{1}{2} = \\ +\ 10\frac{3}{5} = \\ \hline \end{array} \begin{array}{r} 26\frac{1\cdot 5}{2\cdot 5} = \\ +10\frac{3\cdot 2}{5\cdot 2} \\ \hline \end{array} \begin{array}{r} 26\frac{5}{10} \\ +10\frac{6}{10} \\ \hline \end{array}$$

$$36\frac{11}{10} = 36+1\frac{1}{10} = 37\frac{1}{10}$$

c. Using inspection, the least common denominator for the fraction parts is 12.

$$\begin{array}{r} 32\frac{2}{3} = \\ -\ 9\frac{5}{12} = \\ \hline \end{array} \begin{array}{r} 32\frac{2\cdot 4}{3\cdot 4} = \\ -9\frac{5}{12} \\ \hline \end{array} \begin{array}{r} 32\frac{8}{12} \\ -9\frac{5}{12} \\ \hline \end{array}$$

$$23\frac{3}{12} = 23\frac{\cancel{3}\cdot 1}{\cancel{3}\cdot 4} = 23\frac{1}{4}$$

d. The least common denominator for the fraction is 35.

$$\begin{array}{r} 14\frac{2}{7} = \\ -\ 6\frac{3}{5} = \\ \hline \end{array} \begin{array}{r} 14\frac{2\cdot 5}{7\cdot 5} = \\ -6\frac{3\cdot 7}{5\cdot 7} \\ \hline \end{array} \begin{array}{r} 14\frac{10}{35} \\ -6\frac{21}{35} \\ \hline \end{array}$$

We will need to borrow from the number 14 in order to do the subtraction.

$$14\frac{10}{35} = 13+1\frac{10}{35} = 13+\frac{45}{35} = 13\frac{45}{35}.$$

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Now perform the subtraction.

$$\begin{array}{r} 14\frac{10}{35} = 13\frac{45}{35} \\ \underline{-6\frac{21}{35} = -6\frac{21}{35}} \\ 7\frac{24}{35} \end{array}$$

e. We need to borrow 1 from the whole number 23 and create a fraction to perform the subtraction. We will choose 1 to be $\frac{11}{11}$.

$$\begin{array}{r} 23 = 22\frac{11}{11} \\ \underline{-17\frac{4}{11} = -17\frac{4}{11}} \\ 5\frac{7}{11} \end{array}$$

11. a. We are interested in the fraction of jobs that will not require college education. This includes the fraction that will require less than high school education plus the fraction that will require a high school graduate education.

$$\begin{aligned} \frac{11}{100}+\frac{6}{25} &= \frac{11}{100}+\frac{6\cdot 4}{25\cdot 4} \\ &= \frac{11}{100}+\frac{24}{100} \\ &= \frac{35}{100} \\ &= \frac{7}{20} \end{aligned}$$

By 2020, $\frac{7}{20}$ of all jobs will not require any college education.

b. We have seen that the phrase "how much greater" implies subtraction. To determine how much greater the fraction that will require a college degree is than the fraction that will require some college, we find the difference of these fractions.

$$\begin{aligned} \frac{7}{20}-\frac{3}{10} &= \frac{7}{20}-\frac{3\cdot 2}{10\cdot 2} \\ &= \frac{7}{20}-\frac{6}{20} \\ &= \frac{1}{20} \end{aligned}$$

By 2020, the fraction of jobs that will require a college degree will be $\frac{1}{20}$ greater than the fraction that will require some college.

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Concept and Vocabulary Check P.3

1. natural

2. prime

3. factors; product

4. $\frac{a}{b}$

5. $\frac{a \cdot c}{b \cdot d}$

6. reciprocals

7. $\frac{d}{c}$

8. $\frac{a+c}{b}$

9. least common denominator

Exercise Set P.3

1. composite; $22 = 2 \cdot 11$

2. composite; $15 = 3 \cdot 5$

3. composite; $20 = 4 \cdot 5$
$= 2 \cdot 2 \cdot 5$

4. composite; $75 = 3 \cdot 25$
$= 3 \cdot 5 \cdot 5$

5. 37 has no factors other than 1 and 37, so 37 is prime.

6. 23 has no factors other than 1 and 23, so 23 is prime.

7. composite; $36 = 4 \cdot 9$
$= 2 \cdot 2 \cdot 3 \cdot 3$

8. composite; $200 = 10 \cdot 20$
$= 2 \cdot 5 \cdot 2 \cdot 10$
$= 2 \cdot 5 \cdot 2 \cdot 2 \cdot 5$

9. composite; $140 = 10 \cdot 14$
$= 2 \cdot 5 \cdot 2 \cdot 7$
$= 2 \cdot 2 \cdot 5 \cdot 7$

10. composite; $110 = 10 \cdot 11$
$= 2 \cdot 5 \cdot 11$

11. 79 has no factors other than 1 and 79, so 79 is prime.

12. 83 has no factors other than 1 and 83, so 83 is prime.

13. composite; $81 = 9 \cdot 9$
$= 3 \cdot 3 \cdot 3 \cdot 3$

14. composite; $64 = 8 \cdot 8 = 2 \cdot 4 \cdot 2 \cdot 4$
$= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

15. composite; $240 = 10 \cdot 24$
$= 2 \cdot 5 \cdot 2 \cdot 12$
$= 2 \cdot 5 \cdot 2 \cdot 3 \cdot 4$
$= 2 \cdot 5 \cdot 2 \cdot 3 \cdot 2 \cdot 2$
$= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5$

16. composite; $360 = 10 \cdot 36$
$= 2 \cdot 5 \cdot 6 \cdot 6$
$= 2 \cdot 5 \cdot 2 \cdot 3 \cdot 2 \cdot 3$
$= 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5$

17. $\frac{10}{16} = \frac{\cancel{2} \cdot 5}{\cancel{2} \cdot 8} = \frac{5}{8}$

18. $\frac{8}{14} = \frac{\cancel{2} \cdot 4}{\cancel{2} \cdot 7} = \frac{4}{7}$

19. $\frac{15}{18} = \frac{\cancel{3} \cdot 5}{\cancel{3} \cdot 6} = \frac{5}{6}$

20. $\frac{18}{45} = \frac{\cancel{9} \cdot 2}{\cancel{9} \cdot 5} = \frac{2}{5}$

21. $\frac{35}{50} = \frac{\cancel{5} \cdot 7}{\cancel{5} \cdot 10} = \frac{7}{10}$

22. $\frac{45}{50} = \frac{\cancel{5} \cdot 9}{\cancel{5} \cdot 10} = \frac{9}{10}$

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23. $\frac{32}{80}=\frac{16\cdot 2}{16\cdot 5}=\frac{2}{5}$

24. $\frac{75}{80}=\frac{5\cdot 15}{5\cdot 16}=\frac{15}{16}$

25. $\frac{44}{50}=\frac{2\cdot 22}{2\cdot 25}=\frac{22}{25}$

26. $\frac{38}{50}=\frac{2\cdot 19}{2\cdot 25}=\frac{19}{25}$

27. $\frac{120}{86}=\frac{2\cdot 60}{2\cdot 43}=\frac{60}{43}$

28. $\frac{116}{86}=\frac{2\cdot 58}{2\cdot 43}=\frac{58}{43}$

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

30. $\frac{3}{7}\cdot\frac{1}{4}=\frac{3\cdot 1}{7\cdot 4}=\frac{3}{28}$

31. $\frac{3}{8}\cdot\frac{7}{11}=\frac{3\cdot 7}{8\cdot 11}=\frac{21}{88}$

32. $\frac{5}{8}\cdot\frac{3}{11}=\frac{5\cdot 3}{8\cdot 11}=\frac{15}{88}$

33. $9\cdot\frac{4}{7}=\frac{9}{1}\cdot\frac{4}{7}=\frac{9\cdot 4}{1\cdot 7}=\frac{36}{7}$ or $5\frac{1}{7}$

34. $8\cdot\frac{3}{7}=\frac{8}{1}\cdot\frac{3}{7}=\frac{8\cdot 3}{1\cdot 7}=\frac{24}{7}$ or $3\frac{3}{7}$

35. $\frac{1}{10}\cdot\frac{5}{6}=\frac{1\cdot 5}{10\cdot 6}=\frac{5}{60}=\frac{5\cdot 1}{5\cdot 12}=\frac{1}{12}$

36. $\frac{1}{8}\cdot\frac{2}{3}=\frac{1\cdot 2}{8\cdot 3}=\frac{2}{24}=\frac{2\cdot 1}{2\cdot 12}=\frac{1}{12}$

37. $\frac{5}{4}\cdot\frac{6}{7}=\frac{5\cdot 6}{4\cdot 7}=\frac{30}{28}=\frac{2\cdot 15}{2\cdot 14}=\frac{15}{14}$ or $1\frac{1}{14}$

38. $\frac{7}{4}\cdot\frac{6}{11}=\frac{7\cdot 6}{4\cdot 11}=\frac{42}{44}=\frac{2\cdot 21}{2\cdot 22}=\frac{21}{22}$

39. $\left(3\frac{3}{4}\right)\left(1\frac{3}{5}\right)=\frac{15}{4}\cdot\frac{8}{5}=\frac{120}{20}=\frac{20\cdot 6}{20\cdot 1}=6$

40. $\left(2\frac{4}{5}\right)\left(1\frac{1}{4}\right)=\frac{14}{5}\cdot\frac{5}{4}=\frac{70}{20}=\frac{10\cdot 7}{10\cdot 2}$

$=\frac{7}{2}$ or $3\frac{1}{2}$

41. $\frac{5}{4}\div\frac{4}{3}=\frac{5}{4}\cdot\frac{3}{4}=\frac{5\cdot 3}{4\cdot 4}=\frac{15}{16}$

42. $\frac{7}{8}\div\frac{2}{3}=\frac{7}{8}\cdot\frac{3}{2}=\frac{7\cdot 3}{8\cdot 2}=\frac{21}{16}$ or $1\frac{5}{16}$

43. $\frac{18}{5}\div 2=\frac{18}{5}\cdot\frac{1}{2}$

$=\frac{18\cdot 1}{5\cdot 2}=\frac{18}{10}=\frac{2\cdot 9}{2\cdot 5}=\frac{9}{5}$ or $1\frac{4}{5}$

44. $\frac{12}{7}\div 3=\frac{12}{7}\cdot\frac{1}{3}$

$=\frac{12\cdot 1}{7\cdot 3}=\frac{12}{21}=\frac{3\cdot 4}{3\cdot 7}=\frac{4}{7}$

45. $2\div\frac{18}{5}=\frac{2}{1}\cdot\frac{5}{18}=\frac{10}{18}=\frac{2\cdot 5}{2\cdot 9}=\frac{5}{9}$

46. $3\div\frac{12}{7}=\frac{3}{1}\cdot\frac{7}{12}=\frac{21}{12}=\frac{3\cdot 7}{3\cdot 4}=\frac{7}{4}$ or $1\frac{3}{4}$

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

48. $\frac{3}{7}\div\frac{1}{7}=\frac{3}{7}\cdot\frac{7}{1}=\frac{3\cdot 7}{7\cdot 1}=\frac{21}{7}=3$

49. $\frac{7}{6}\div\frac{5}{3}=\frac{7}{6}\cdot\frac{3}{5}=\frac{7\cdot 3}{6\cdot 5}=\frac{21}{30}=\frac{3\cdot 7}{3\cdot 10}=\frac{7}{10}$

50. $\frac{7}{4}\div\frac{3}{8}=\frac{7}{4}\cdot\frac{8}{3}=\frac{7\cdot 8}{4\cdot 3}=\frac{56}{12}=\frac{4\cdot 14}{4\cdot 3}$

$=\frac{14}{3}$ or $4\frac{2}{3}$

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

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

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53. $6\frac{3}{5} \div 1\frac{1}{10} = \frac{33}{5} \div \frac{11}{10}$

$= \frac{33}{5} \cdot \frac{10}{11} = \frac{\cancel{11} \cdot 3}{\cancel{5}} \cdot \frac{\cancel{5} \cdot 2}{\cancel{11}} = \frac{6}{1} = 6$

54. $1\frac{3}{4} \div 2\frac{5}{8} = \frac{7}{4} \div \frac{21}{8}$

$= \frac{7}{4} \cdot \frac{8}{21} = \frac{56}{84} = \frac{\cancel{28} \cdot 2}{\cancel{28} \cdot 3} = \frac{2}{3}$

55. $\frac{2}{11} + \frac{4}{11} = \frac{2+4}{11} = \frac{6}{11}$

56. $\frac{5}{13} + \frac{2}{13} = \frac{5+2}{13} = \frac{7}{13}$

57. $\frac{7}{12} + \frac{1}{12} = \frac{8}{12} = \frac{\cancel{4} \cdot 2}{\cancel{4} \cdot 3} = \frac{2}{3}$

58. $\frac{5}{16} + \frac{1}{16} = \frac{6}{16} = \frac{\cancel{2} \cdot 3}{\cancel{2} \cdot 8} = \frac{3}{8}$

59. $\frac{5}{8} + \frac{5}{8} = \frac{10}{8} = \frac{\cancel{2} \cdot 5}{\cancel{2} \cdot 4} = \frac{5}{4}$ or $1\frac{1}{4}$

60. $\frac{3}{8} + \frac{3}{8} = \frac{6}{8} = \frac{\cancel{2} \cdot 3}{\cancel{2} \cdot 4} = \frac{3}{4}$

61. $\frac{7}{12} - \frac{5}{12} = \frac{2}{12} = \frac{\cancel{2} \cdot 1}{\cancel{2} \cdot 6} = \frac{1}{6}$

62. $\frac{13}{18} - \frac{5}{18} = \frac{8}{18} = \frac{\cancel{2} \cdot 4}{\cancel{2} \cdot 9} = \frac{4}{9}$

63. $\frac{16}{7} - \frac{2}{7} = \frac{14}{7} = \frac{\cancel{7} \cdot 2}{\cancel{7} \cdot 1} = 2$

64. $\frac{17}{5} - \frac{2}{5} = \frac{15}{5} = 3$

65. $3\frac{2}{5}$

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

$5\frac{3}{5}$ or $\frac{28}{5}$

66. $2\frac{5}{8}$

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

$3\frac{6}{8} = 3\frac{3}{4}$ or $\frac{15}{4}$

67. $5\frac{3}{8}$

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

$3\frac{2}{8} = 3\frac{1}{4}$ or $\frac{13}{4}$

68. $4\frac{3}{10}$

$-1\frac{1}{10}$

$3\frac{2}{10} = 3\frac{1}{5}$ or $\frac{16}{5}$

69. $\frac{1}{2} + \frac{1}{5} = \frac{1}{2} \cdot \frac{5}{5} + \frac{1}{5} \cdot \frac{2}{2}$

$= \frac{5}{10} + \frac{2}{10} = \frac{5+2}{10} = \frac{7}{10}$

70. $\frac{1}{3} + \frac{1}{5} = \frac{1}{3} \cdot \frac{5}{5} + \frac{1}{5} \cdot \frac{3}{3}$

$= \frac{5}{15} + \frac{3}{15} = \frac{5+3}{15} = \frac{8}{15}$

71. $\frac{3}{4} + \frac{3}{20} = \frac{3}{4} \cdot \frac{5}{5} + \frac{3}{20}$

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

$= \frac{18}{20} = \frac{\cancel{2} \cdot 9}{\cancel{2} \cdot 10} = \frac{9}{10}$

72. $\frac{2}{5} + \frac{2}{15} = \frac{2}{5} \cdot \frac{3}{3} + \frac{2}{15}$

$= \frac{6}{15} + \frac{2}{15} = \frac{8}{15}$

73. $\frac{3}{8} + \frac{5}{12} = \frac{3}{8} \cdot \frac{3}{3} + \frac{5}{12} \cdot \frac{2}{2}$

$= \frac{9}{24} + \frac{10}{24} = \frac{19}{24}$

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74. $\frac{3}{10}+\frac{2}{15}=\frac{3}{10}\cdot\frac{3}{3}+\frac{2}{15}\cdot\frac{2}{2}$

$=\frac{9}{30}+\frac{4}{30}=\frac{13}{30}$

75. $\frac{11}{18}-\frac{2}{9}=\frac{11}{18}-\frac{2}{9}\cdot\frac{2}{2}=\frac{11}{18}-\frac{4}{18}=\frac{7}{18}$

76. $\frac{17}{18}-\frac{4}{9}=\frac{17}{18}-\frac{4}{9}\cdot\frac{2}{2}=\frac{17}{18}-\frac{8}{18}=\frac{9}{18}$

$=\frac{\cancel{9}\cdot 1}{\cancel{9}\cdot 2}=\frac{1}{2}$

77. $\frac{4}{3}-\frac{3}{4}=\frac{4}{3}\cdot\frac{4}{4}-\frac{3}{4}\cdot\frac{3}{3}$

$=\frac{16}{12}-\frac{9}{12}=\frac{7}{12}$

78. $\frac{3}{2}-\frac{2}{3}=\frac{3}{2}\cdot\frac{3}{3}-\frac{2}{3}\cdot\frac{2}{2}$

$=\frac{9}{6}-\frac{4}{6}=\frac{5}{6}$

79.
$$\begin{array}{r} 3\frac{3}{7}=\ 3\frac{3\cdot 2}{7\cdot 2}=\ 3\frac{6}{14} \\ +\ 2\frac{1}{14}=+\ 2\frac{1}{14}=+2\frac{1}{14} \\ \hline 5\frac{7}{14}=5\frac{1}{2}\text{ or }\frac{11}{2} \end{array}$$

80.
$$\begin{array}{r} 1\frac{2}{3}=\ 1\frac{4}{6} \\ +\ 4\frac{1}{2}=+4\frac{3}{6} \\ \hline 5\frac{7}{6}=6\frac{1}{6}\text{ or }\frac{37}{6} \end{array}$$

81. $3\frac{3}{4}-2\frac{1}{3}=\frac{15}{4}-\frac{7}{3}$

$=\frac{15}{4}\cdot\frac{3}{3}-\frac{7}{3}\cdot\frac{4}{4}$

$=\frac{45}{12}-\frac{28}{12}=\frac{17}{12}\text{ or }1\frac{5}{12}$

82. $3\frac{2}{3}-2\frac{1}{2}=\frac{11}{3}-\frac{5}{2}$

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

$=\frac{22}{6}-\frac{15}{6}=\frac{7}{6}\text{ or }1\frac{1}{6}$

83.
$$\begin{array}{r} 6\frac{2}{21} \\ +\ 3\frac{7}{21} \\ \hline 9\frac{9}{21}=9\frac{3}{7} \end{array}$$

84.
$$\begin{array}{r} 9\frac{3}{14} \\ +\ 14\frac{4}{14} \\ \hline 23\frac{7}{14}=23\frac{1}{2} \end{array}$$

85.
$$\begin{array}{r} 5\frac{11}{14} \\ +\ 20\frac{7}{14} \\ \hline 25\frac{18}{14}=26\frac{4}{14}=26\frac{2}{7} \end{array}$$

86.
$$\begin{array}{r} 7\frac{13}{14} \\ +\ 30\frac{7}{14} \\ \hline 37\frac{20}{14}=38\frac{6}{14}=38\frac{3}{7} \end{array}$$

87.
$$\begin{array}{r} 14\frac{8}{15} \\ -\ 2\frac{2}{15} \\ \hline 12\frac{6}{15}=12\frac{2}{5} \end{array}$$

88.
$$\begin{array}{r} 13\frac{5}{6} \\ -\ 2\frac{1}{6} \\ \hline 11\frac{4}{6}=11\frac{2}{3} \end{array}$$

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89.
$$\begin{array}{r} 7\frac{2}{9} = 6\frac{11}{9} \\ \underline{-4\frac{5}{9} = -4\frac{5}{9}} \\ 2\frac{6}{9} = 2\frac{2}{3} \end{array}$$

90.
$$\begin{array}{r} 6\frac{2}{7} = 5\frac{9}{7} \\ \underline{-3\frac{5}{7} = -3\frac{5}{7}} \\ 2\frac{4}{7} \end{array}$$

91.
$$\begin{array}{r} 15\frac{1}{3} = 15\frac{2}{6} \\ \underline{+12\frac{1}{6} = +12\frac{1}{6}} \\ 27\frac{3}{6} = 27\frac{1}{2} \end{array}$$

92.
$$\begin{array}{r} 18\frac{3}{5} = 18\frac{6}{10} \\ \underline{+22\frac{3}{10} = +22\frac{3}{10}} \\ 40\frac{9}{10} \end{array}$$

93.
$$\begin{array}{r} 87\frac{4}{5} = 87\frac{16}{20} \\ \underline{+72\frac{3}{4} = +72\frac{15}{20}} \\ 159\frac{31}{20} = 160\frac{11}{20} \end{array}$$

94.
$$\begin{array}{r} 55\frac{4}{9} = 55\frac{16}{36} \\ \underline{+63\frac{3}{4} = +63\frac{27}{36}} \\ 118\frac{43}{36} = 119\frac{7}{36} \end{array}$$

95.
$$\begin{array}{r} 56\frac{5}{6} = 56\frac{25}{30} \\ \underline{-18\frac{7}{10} = -18\frac{21}{30}} \\ 38\frac{4}{30} = 38\frac{2}{15} \end{array}$$

96.
$$\begin{array}{r} 51\frac{2}{3} = 51\frac{4}{6} \\ \underline{-26\frac{1}{2} = -26\frac{3}{6}} \\ 25\frac{1}{6} \end{array}$$

97.
$$\begin{array}{r} 19\frac{1}{3} = 19\frac{2}{6} = 18\frac{8}{6} \\ \underline{-4\frac{1}{2} = -4\frac{3}{6} = -4\frac{3}{6}} \\ 14\frac{5}{6} \end{array}$$

98.
$$\begin{array}{r} 29\frac{1}{10} = 29\frac{2}{20} = 28\frac{22}{20} \\ \underline{-5\frac{1}{4} = -5\frac{5}{20} = -5\frac{5}{20}} \\ 23\frac{17}{20} \end{array}$$

99.
$$\left(\frac{1}{2}-\frac{1}{3}\right)\div\frac{5}{8} = \left(\frac{3}{6}-\frac{2}{6}\right)\div\frac{5}{8}$$
$$= \frac{1}{6}\div\frac{5}{8}$$
$$= \frac{1}{6}\cdot\frac{8}{5} = \frac{8}{30} = \frac{\cancel{2}\cdot 4}{\cancel{2}\cdot 15} = \frac{4}{15}$$

100.
$$\left(\frac{1}{2}+\frac{1}{4}\right)\div\left(\frac{1}{2}+\frac{1}{3}\right) = \left(\frac{2}{4}+\frac{1}{4}\right)\div\left(\frac{3}{6}+\frac{2}{6}\right)$$
$$= \frac{3}{4}\div\frac{5}{6}$$
$$= \frac{3}{4}\cdot\frac{6}{5}$$
$$= \frac{18}{20} = \frac{\cancel{2}\cdot 9}{\cancel{2}\cdot 10} = \frac{9}{10}$$

101.
$$\left(\frac{2}{3}\div\frac{4}{3}\right)+\left(\frac{1}{6}+\frac{3}{4}\right) = \left(\frac{2}{3}\cdot\frac{3}{4}\right)+\left(\frac{2}{12}+\frac{9}{12}\right)$$
$$= \frac{1}{2}+\frac{11}{12}$$
$$= \frac{6}{12}+\frac{11}{12}$$
$$= \frac{17}{12} = 1\frac{5}{12}$$

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102. $\left(\frac{3}{5}\div\frac{9}{10}\right)+\left(\frac{7}{10}-\frac{8}{15}\right)=\left(\frac{3}{5}\cdot\frac{10}{9}\right)+\left(\frac{21}{30}-\frac{16}{30}\right)$

$$=\frac{2}{3}+\frac{5}{30}$$
$$=\frac{2}{3}+\frac{1}{6}$$
$$=\frac{4}{6}+\frac{1}{6}$$
$$=\frac{5}{6}$$

103. a. $\frac{10}{50}+\frac{6}{50}=\frac{16}{50}=\frac{8}{25}$

b. The phrase "how much greater" implies we should subtract fractions.
$\frac{10}{50}-\frac{6}{50}=\frac{10-6}{50}=\frac{4}{50}=\frac{2}{25}$

104. a. $\frac{7}{50}+\frac{5}{50}=\frac{12}{50}=\frac{6}{25}$

b. The phrase "how much greater" implies we should subtract fractions.
$\frac{7}{50}-\frac{5}{50}=\frac{7-5}{50}=\frac{2}{50}=\frac{1}{25}$

105. a. $11\frac{1}{10}+6\frac{9}{10}=17\frac{10}{10}=18$ hours

b. $11\frac{1}{10}-6\frac{9}{10}=10\frac{11}{10}-6\frac{9}{10}=4\frac{2}{10}=4\frac{1}{5}$ hours

106. a. $10\frac{4}{10}+7\frac{7}{10}=17\frac{11}{10}=18\frac{1}{10}$ hours

b. $10\frac{4}{10}-7\frac{7}{10}=9\frac{14}{10}-7\frac{7}{10}=2\frac{7}{10}$

107. a. $\frac{8}{9}\cdot\frac{8}{9}=\frac{64}{81}$

b. $\frac{3}{4}\cdot\frac{8}{9}=\frac{24}{36}=\frac{12\cdot2}{12\cdot3}=\frac{2}{3}$

c. There are black keys to the left of the keys for the notes D, E, G, A, and B.

108. The numbers are the prime numbers between 2 and 97, inclusive.

109. – 116. Answers will vary.

117. makes sense

118. makes sense

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119. makes sense

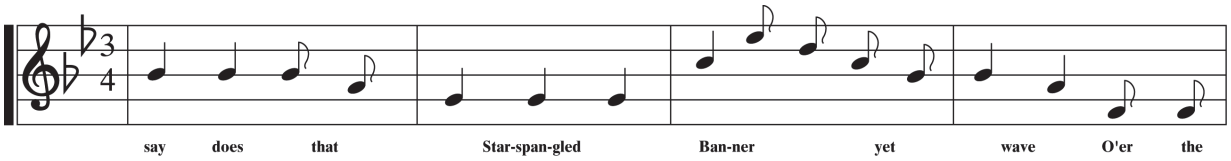
120. does not make sense; Explanations will vary. Sample explanation: When adding fractions, we need to have a common denominator before adding the fractions.

121. does not make sense; Explanations will vary. Sample explanation: Although that method will work, it is easier to leave them as mixed numbers and perform the addition.

122. makes sense

123.
$$\begin{aligned}\frac{1}{1\cdot 2}+\frac{1}{2\cdot 3}+\frac{1}{3\cdot 4}+\frac{1}{4\cdot 5}+\frac{1}{5\cdot 6} &= \frac{1}{2}+\frac{1}{2\cdot 3}+\frac{1}{3\cdot 2^2}+\frac{1}{2^2\cdot 5}+\frac{1}{5\cdot 2\cdot 3}\\ &= \frac{1\cdot 2\cdot 3\cdot 5}{2\cdot 2\cdot 3\cdot 5}+\frac{1\cdot 2\cdot 5}{2\cdot 3\cdot 2\cdot 5}+\frac{1\cdot 5}{3\cdot 2^2\cdot 5}+\frac{1\cdot 3}{2^2\cdot 5\cdot 3}+\frac{1\cdot 2}{5\cdot 2\cdot 3\cdot 2}\\ &= \frac{30}{60}+\frac{10}{60}+\frac{5}{60}+\frac{3}{60}+\frac{2}{60}\\ &= \frac{50}{60}\\ &= \frac{5}{6}\end{aligned}$$

124. The notes in each measure add to $\frac{3}{4}$.



Check Points P.4

1. **a.** The underlined digit of $3.2\underline{5}8$ is in the hundredths place.

b. The underlined digit of $6.\underline{9}347$ is in the tenths place.

c. The underlined digit of $2056.31\underline{4}79$ is in the thousandths place.

d. The underlined digit of $0.002\underline{5}76$ is in the hundred-thousandths place.

e. The underlined digit of $22.005124\underline{6}89$ is in the millionths place.

2. Work from left to right. Write the whole-number part in words, followed by the word "and" for the decimal point. Then write the decimal part in words as though it were a whole number and follow it by the place value of the last digit.

a. nineteen and twenty-four hundredths

b. eight hundred twenty-six and three hundred seventy-five thousandths

c. fifty-two ten-thousandths

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3. a. Write the digits for the whole-number part, which comes before the word "and." Write a decimal point for the word "and." Then write the digits for the decimal part as if it were a whole number.

$$\overbrace{\text{forty-five}}^{45}\ \overbrace{\text{and}}^{.}\ \overbrace{\text{thirty-two hundredths}}^{32}$$

Make sure the last digit is in the hundredths place.
The standard form for the number is 45.32.

b. Write the digits for the whole-number part, which comes before the word "and." Write a decimal point for the word "and." Then write the digits for the decimal part as if it were a whole number.

$$\overbrace{\text{four hundred}}^{400}\ \overbrace{\text{and}}^{.}\ \overbrace{\text{eleven thousandths}}^{11}$$

Make sure the last digit is in the thousandths place by inserting a 0 in the tenths place.
The standard form for the number is 400.011.

c. The word form does not contain the word "and" thus, the whole-number part is zero.

$$\overbrace{\text{four hundred eleven thousandths}}^{411}$$

Make sure the last digit is in the thousandths place.
The standard form for the number is 0.411.

d. Write the digits for the whole-number part, which comes before the word "and." Write a decimal point for the word "and." Then write the digits for the decimal part as if it were a whole number.

$$\overbrace{\text{eight}}^{8}\ \overbrace{\text{and}}^{.}\ \overbrace{\text{fifty-two ten-thousandths}}^{52}$$

Make sure the last digit is in the ten-thousandths place by inserting a 0 in the tenths place and the hundredths place.
The standard form for the number is 8.0052.

4. a. 0.7 has 1 decimal place so the denominator will contain 1 zero, or 10.

$$0.7 = \frac{7}{10}$$

b. 0.59 has 2 decimal places so the denominator will contain 2 zeros, or 100.

$$0.59 = \frac{59}{100}$$

c. 0.012 has 3 decimal places so the denominator will contain 3 zeros, or 1000.

$$0.012 = \frac{12}{1000} = \frac{\cancel{4}\cdot 3}{\cancel{4}\cdot 250} = \frac{3}{250}$$

5. a. 72.6 has 1 decimal place so the denominator will contain 1 zero, or 10.

$$72.6 = 72\frac{6}{10} = 72\frac{\cancel{2}\cdot 3}{\cancel{2}\cdot 5} = 72\frac{3}{5}$$

b. 184.083 has 3 decimal places so the denominator will contain 3 zeros, or 1000.

$$184.083 = 184\frac{83}{1000}$$

c. 5.0044 has 4 decimal places so the denominator will contain 4 zeros, or 10,000.

$$5.0044 = 5\frac{44}{10,000} = 5\frac{\cancel{4}\cdot 11}{\cancel{4}\cdot 2500} = 5\frac{11}{2500}$$

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6. a. The digit to the right of the tenths digit is 3, which is less than 5. Therefore do not change the digit to be rounded. Drop all digits to the right of the tenths place.
$23.436 \approx 23.4$

b. The digit to the right of the hundredths digit is 6, which is greater than 5. Therefore we add 1 to the hundredths digit. Drop all digits to the right of the hundredths place.
$392.7869 \approx 392.79$

c. The digit to the right of the thousandths digit is 5. Therefore we add 1 to the thousandths digit. Drop all digits to the right of the thousandths place.
$1400.61558 \approx 1400.616$

d. The digit to the right of the ones digit is 6, which is greater than 5. Therefore we add 1 to the ones digit. Drop all digits to the right of the ones place.
$298.603 \approx 299$

7. The digit to the right of the hundredths digit is 6, which is greater than 5. Therefore we add 1 to the hundredths digit: $9+1=10$. Record 0 in the hundredths place and carry the 1 to the tenths place.
$38.496 \approx 38.50$

Concept and Vocabulary Check P.4

1. whole-number; decimal

2. tens; ones; tenths; hundredths

3. and; thousandths

4. 10; 100; 1000

5. 6; 7; add 1; 12.37

Exercise Set P.4

1. hundredths

2. hundredths

3. thousandths

4. thousandths

5. tens

6. tens

7. ten-thousandths

8. ten-thousandths

9. millionths

10. millionths

11. hundred-thousandths

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12. hundred-thousandths

13. seven and sixty-three hundredths

14. eight and fifty-seven hundredths

15. sixteen and six tenths

16. eighteen and eight tenths

17. eight hundred sixty-five and two hundred five thousandths

18. six hundred eighty-five and three hundred seven thousandths

19. twenty-three ten-thousandths

20. thirty-two ten-thousandths

21. six thousand and three thousandths

22. three thousand and six thousandths

23. two hundred seven and twenty-seven hundred-thousandths

24. three hundred nine and thirty-nine hundred-thousandths

25. The standard form is 5.9.

26. The standard form is 4.7.

27. The standard form is 17.37.

28. The standard form is 19.29.

29. The standard form is 800.08.

30. The standard form is 900.09.

31. The standard form is 306.535.

32. The standard form is 507.543.

33. The standard form is 0.292.

34. The standard form is 0.529.

35. The standard form is 200.092.

36. The standard form is 500.029.

37. The standard form is 0.0075.

38. The standard form is 0.0057.

39. $0.3 = \frac{3}{10}$

40. $0.9 = \frac{9}{10}$

41. $0.39 = \frac{39}{100}$

42. $0.37 = \frac{37}{100}$

43. $0.8 = \frac{8}{10} = \frac{\cancel{2} \cdot 4}{\cancel{2} \cdot 5} = \frac{4}{5}$

44. $0.6 = \frac{6}{10} = \frac{\cancel{2} \cdot 3}{\cancel{2} \cdot 5} = \frac{3}{5}$

45. $0.64 = \frac{64}{100} = \frac{\cancel{4} \cdot 16}{\cancel{4} \cdot 25} = \frac{16}{25}$

46. $0.75 = \frac{75}{100} = \frac{\cancel{25} \cdot 3}{\cancel{25} \cdot 4} = \frac{3}{4}$

47. $3.005 = 3\frac{5}{1000} = 3\frac{\cancel{5} \cdot 1}{\cancel{5} \cdot 200} = 3\frac{1}{200}$

48. $7.005 = 7\frac{5}{1000} = 7\frac{\cancel{5} \cdot 1}{\cancel{5} \cdot 200} = 7\frac{1}{200}$

49. $876.32 = 876\frac{32}{100} = 876\frac{\cancel{4} \cdot 8}{\cancel{4} \cdot 25} = 876\frac{8}{25}$

50. $678.34 = 678\frac{34}{100} = 678\frac{\cancel{2} \cdot 17}{\cancel{2} \cdot 50} = 678\frac{17}{50}$

51. $0.0009 = \frac{9}{10,000}$

52. $0.0007 = \frac{7}{10,000}$

53. $17.268 = 17\frac{268}{1000} = 17\frac{\cancel{4} \cdot 67}{\cancel{4} \cdot 250} = 17\frac{67}{250}$

54. $19.375 = 19\frac{375}{1000} = 19\frac{\cancel{125} \cdot 3}{\cancel{125} \cdot 8} = 19\frac{3}{8}$

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55. $0.4006 = \dfrac{4006}{10,000} = \dfrac{\cancel{2}\cdot 2003}{\cancel{2}\cdot 5000} = \dfrac{2003}{5000}$

56. $0.6004 = \dfrac{6004}{10,000} = \dfrac{\cancel{4}\cdot 1501}{\cancel{4}\cdot 2500} = \dfrac{1501}{2500}$

57. 0.38 rounded to the nearest tenth is 0.4.

58. 0.27 rounded to the nearest tenth is 0.3.

59. 0.8647 rounded to the nearest hundredth is 0.86.

60. 0.7843 rounded to the nearest hundredth is 0.78.

61. 24.23651 rounded to the nearest thousandth is 24.237.

62. 37.32851 rounded to the nearest thousandth is 37.329.

63. 63.498 rounded to the nearest hundredth is 63.50.

64. 71.396 rounded to the nearest hundredth is 71.40.

65. 32.98601 rounded to the nearest tenth is 33.0.

66. 43.97801 rounded to the nearest tenth is 44.0.

67. 32.98601 rounded to the nearest ten is 30.

68. 43.97801 rounded to the nearest ten is 40.

69. 0.041652 rounded to the nearest ten-thousandth is 0.0417.

70. 0.032751 rounded to the nearest ten-thousandth is 0.0328.

71. 318.489 rounded to the nearest whole number is 318.

72. 617.498 rounded to the nearest whole number is 617.

73. one thousand, five and one hundred five ten-billionths

74. two thousand, seven and two hundred seven ten-billionths

75. $11.00011101 = 11\dfrac{11,101}{100,000,000}$

76. $13.00011103 = 13\dfrac{11,103}{100,000,000}$

77. In 2014 the average age of cars on U.S. roads was at a maximum of $11.4 = 11\dfrac{4}{10} = 11\dfrac{2}{5}$ years.

78. In 2008 the average age of cars on U.S. roads was at a minimum of $10.1 = 10\dfrac{1}{10}$ years.

79. In 2010 the average vehicle age was between 10.5 and 11.0 years at ten and sixth tenths years.

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80. In 2012 the average vehicle age was between 11.0 and 11.4 years at eleven and two tenths years.

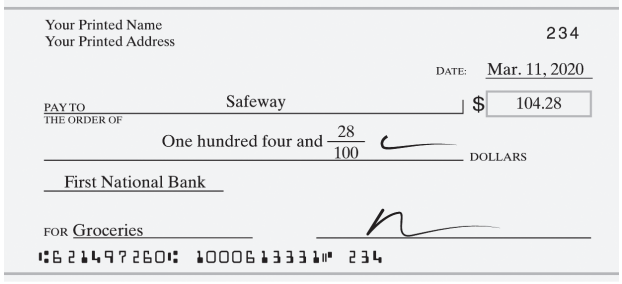
81. In 2008 the average age of vehicles on the U.S. roads was 10.1 years , which rounded to the nearest whole number equals 10 years.

82. In 2010, 2012, and 2014 the average age of vehicles on the U.S. roads when rounded to the nearest whole number equals 11 years.

83. In 2012 the average age of cars on U.S. roads was $11\frac{1}{5}$ years because $11.2 = 11\frac{2}{10} = 11\frac{1}{5}$ years.

84. In 2010 the average age of cars on U.S. roads was $10\frac{3}{5}$ years because $10.6 = 10\frac{6}{10} = 10\frac{3}{5}$ years.

85. Check to Safeway:


Your Printed Name
Your Printed Address

234

DATE: Mar. 11, 2020

PAY TO THE ORDER OF Safeway $ 104.28

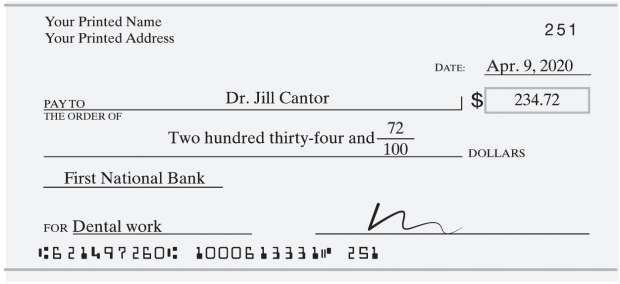
One hundred four and 28/100 DOLLARS

First National Bank

FOR Groceries

⑆621497260⑆ 10006133341" 234

86. Check to Dr. Jill Cantor:


Your Printed Name
Your Printed Address

251

DATE: Apr. 9, 2020

PAY TO THE ORDER OF Dr. Jill Cantor $ 234.72

Two hundred thirty-four and 72/100 DOLLARS

First National Bank

FOR Dental work

⑆621497260⑆ 10006133341" 251

87. Cobra: nine thousandths

88. Krait, five tenths

89. cobra, mamba, brown snake, taipan, krait because $0.009 < 0.02 < 0.05 < 0.11 < 0.5$.

90. krait, taipan, brown snake, mamba, cobra because $0.009 < 0.02 < 0.05 < 0.11 < 0.5$.

91. **a.** $4.539 rounded to the nearest cent is $4.54.

b. $4.539 rounded to the nearest whole dollar is $5.

92. **a.** $4.239 rounded to the nearest cent is $4.24.

b. $4.239 rounded to the nearest whole dollar is $4.

93. 2.718281828459045 rounded to the nearest hundredth is 2.72.

94. 2.718281828459045 rounded to the nearest thousandth is 2.718.

95. 2.718281828459045 rounded to the nearest ten-thousandth is 2.7183.

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96. 2.718281828459045 rounded to the nearest millionth is 2.718282.

97. – 101. Answers will vary.

102. does not make sense; Explanations will vary. Sample explanation: The place values to the immediate left of a decimal start with ones.

103. does not make sense; Explanations will vary. Sample explanation: 0.17 in words is seventeen hundredths.

104. does not make sense; Explanations will vary. Sample explanation: Adding zeroes before the first digit in a number's decimal part will change the value of the number. Adding zeroes after the last digit in a number's decimal part will not change the value of the number.

105. Answers will vary; an example is 18.6001.

106. Answers will vary; an example is 23.5399.

107. Answers will vary; an example is 62.35.

108. $9\frac{3}{25} = 9\frac{3 \cdot 4}{25 \cdot 4} = 9\frac{12}{100} = 9.12$

Mid-Chapter P Check Point

1. eight billion, sixty-three million, five hundred sixty-one thousand, four

2. 54,302,628

3. **a.** nearest hundred:
$64,517 \approx 64,500$

b. nearest thousand:
$64,517 \approx 65,000$

4. $18 > 0$

5. $18 < 19$

6. **a.** The James Bond franchise had the greatest number of movies.
The total world gross for this franchise was \$5,116,147,171.

b. three billion, two hundred eighty-seven million, two hundred eighty-five thousand, five dollars

c. Star Wars had 7 movies.
$\$4,279,632,749 \approx \$4,000,000,000$

d. Shrek and Lord of the Rings each had total world gross less than \$3,500,000,000.

7. **a.**
$$\begin{array}{rl} 61 & (1980) \\ -\,28 & (\text{Ancient Greece and Rome}) \\ \hline 33 & \end{array}$$
People born in 1980 are expected to live 33 years more than people born in ancient Greece and Rome.

b. Average life expectancy was 48 years in 1950.

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c. The following life expectancies round to 30.

Stone Age: $25 \approx 30$

Ancient Greece and Rome: $28 \approx 30$

Middle Ages: $30 \approx 30$

1900: $31 \approx 30$

d. life expectancy 1950: 48
life expectancy Middle Ages: 30

$48 \stackrel{?}{=} 2 \cdot 30 - 12$

$48 \stackrel{?}{=} 60 - 12$

$48 \stackrel{?}{=} 48$ true

8. There are 2 parts shaded out of a total 5 equal parts. Thus, the fraction $\frac{2}{5}$ (two-fifths) represents the shaded portion of the figure.

9. Improper Fraction: $\frac{7}{3}$.

Mixed Number: $2\frac{1}{3}$.

10. $4\frac{7}{10} = \frac{10 \cdot 4 + 7}{10} = \frac{47}{10}$

11. $\frac{85}{6} = 14\frac{1}{6}$

12. $150 = 10 \cdot 15$
$= 2 \cdot 5 \cdot 3 \cdot 5$

13. $\frac{12}{28} = \frac{4 \cdot 3}{4 \cdot 7} = \frac{3}{7}$

14. $\frac{5}{24} \cdot \frac{8}{15} = \frac{\overset{1}{\cancel{5}}}{\underset{3}{\cancel{24}}} \cdot \frac{\overset{1}{\cancel{8}}}{\underset{3}{\cancel{15}}} = \frac{1}{9}$

15. $6 \cdot \frac{7}{12} = \frac{\overset{1}{\cancel{6}}}{1} \cdot \frac{7}{\underset{2}{\cancel{12}}} = \frac{7}{2} = 3\frac{1}{2}$

16. $\left(1\frac{2}{3}\right)\left(2\frac{1}{4}\right) = \frac{5}{3} \cdot \frac{9}{4} = \frac{5}{\underset{1}{\cancel{3}}} \cdot \frac{\overset{3}{\cancel{9}}}{4} = \frac{15}{4} = 3\frac{3}{4}$

17. $\frac{14}{15} \div \frac{7}{5} = \frac{14}{15} \cdot \frac{5}{7} = \frac{\overset{2}{\cancel{14}}}{\underset{3}{\cancel{15}}} \cdot \frac{\overset{1}{\cancel{5}}}{\underset{1}{\cancel{7}}} = \frac{2}{3}$

18. $4\frac{1}{6} \div 2\frac{2}{9} = \frac{25}{6} \div \frac{20}{9} = \frac{25}{6} \cdot \frac{9}{20} = \frac{\overset{5}{\cancel{25}}}{\underset{2}{\cancel{6}}} \cdot \frac{\overset{3}{\cancel{9}}}{\underset{4}{\cancel{20}}} = \frac{15}{8} = 1\frac{7}{8}$

19. $\frac{10}{21} \div \frac{15}{14} = \frac{10}{21} \cdot \frac{14}{15} = \frac{\overset{2}{\cancel{10}}}{\underset{3}{\cancel{21}}} \cdot \frac{\overset{2}{\cancel{14}}}{\underset{3}{\cancel{15}}} = \frac{4}{9}$

20.
$$\begin{array}{r} \frac{1}{6} = \frac{5}{30} \\ +\frac{3}{10} = +\frac{9}{30} \\ \hline \frac{14}{30} = \frac{7}{15} \end{array}$$

21.
$$\begin{array}{r} \frac{13}{18} = \frac{26}{36} \\ -\frac{5}{12} = -\frac{15}{36} \\ \hline \frac{11}{36} \end{array}$$

22.
$$\begin{array}{r} 1\frac{2}{5} = 1\frac{16}{40} \\ +\ 3\frac{7}{8} = +3\frac{35}{40} \\ \hline 4\frac{51}{40} = 5\frac{11}{40} \end{array}$$

23.
$$\begin{array}{rrr} 5\frac{1}{2} = & 5\frac{3}{6} = & 4\frac{9}{6} \\ -\ 2\frac{2}{3} = & -2\frac{4}{6} = & -2\frac{4}{6} \\ \hline & & 2\frac{5}{6} \end{array}$$

24. $35 - 15 = 20$ questions left.
$\frac{20}{35} = \frac{4}{7}$ of the test left.

25. hundredths

26. twenty-three and two hundred three thousandths

27. The standard form is 3003.03.

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28. $0.25 = \frac{25}{100} = \frac{\cancel{25} \cdot 1}{\cancel{25} \cdot 4} = \frac{1}{4}$

29. $7.0019 = 7\frac{19}{10,000}$

30. 416.752 rounded to the nearest tenth is 416.8.

31. 0.236499 rounded to the nearest thousandth is 0.236.

Check Points P.5

1. Write the numbers vertically, lining up the decimal points. Add zeroes as placeholders if needed. Add the digits from right to left. Align the decimal point in the sum with the other decimal points.

a.
$$\begin{array}{r} 12.64 \\ +\,2.30 \\ \hline 14.94 \end{array}$$

b.
$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ \ \ \ \ } \\ 19.8426 \\ +\ 7.0800 \\ \hline 26.9226 \end{array}$$

2. Write the numbers vertically, lining up the decimal points. Add zeroes as placeholders if needed. Add the digits from right to left. Align the decimal point in the sum with the other decimal points.

$$\begin{array}{r} {\scriptstyle 1\ \ 21\ \ \ \ \ \ } \\ 7.2800 \\ 25.0831 \\ +\ 0.4890 \\ \hline 32.8521 \end{array}$$

3. Write the numbers vertically, lining up the decimal points. Subtract the digits from right to left. Align the decimal point in the difference with the other decimal points.

$$\begin{array}{r} 257.86 \\ -\,11.53 \\ \hline 246.33 \end{array} \qquad \text{Check:} \quad \begin{array}{r} 246.33 \\ +\,11.53 \\ \hline 257.86 \end{array}$$

4. Write the numbers vertically, lining up the decimal points. Insert zero as a placeholder in the subtrahend. Subtract the digits from right to left. Borrow as shown. Align the decimal point in the difference with the other decimal points.

$$\begin{array}{r} {\scriptstyle \ 7\ 13\,11\ \ \ \ } \\ 28.416 \\ -\,17.950 \\ \hline 10.466 \end{array} \qquad \text{Check:} \quad \begin{array}{r} 10.466 \\ +\,17.950 \\ \hline 28.416 \end{array}$$

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5. Write the numbers vertically, lining up the decimal points. Insert zeros as placeholders in the minuend as needed. Subtract the digits from right to left. Borrow as shown. Align the decimal point in the difference with the other decimal points.

a.
$$\begin{array}{r} {\scriptstyle 5\ \ 9\ \ 10} \\ 3.\cancel{6}\ \cancel{0}\ \cancel{0} \\ -\ 0.\ 0\ \ 8\ \ 7 \\ \hline 3.5\ \ 1\ \ 3 \end{array} \qquad \text{Check:} \quad \begin{array}{r} 3.513 \\ +\ 0.087 \\ \hline 3.600 \end{array}$$

b.
$$\begin{array}{r} {\scriptstyle 6\ \ 12\ \ 9\ \ 10} \\ \cancel{7}\ \cancel{3}.\cancel{0}\ \cancel{0} \\ -\ 2\ 6.4\ 5 \\ \hline 4\ 6.5\ 5 \end{array} \qquad \text{Check:} \quad \begin{array}{r} 46.55 \\ +\ 26.45 \\ \hline 73.00 \end{array}$$

6. $\overbrace{20}^{\text{health care}} - \overbrace{(1.4+1)}^{\text{transportation and science combined}} = 20 - 2.4$
$= 17.6$

For every tax dollar collected, 17.6¢ more was spent on health care than on transportation and science combined.

7. a. The first factor has 2 decimal places. The second factor has 1 decimal place. Insert the decimal point in the product so that there are 2 + 1 = 3 decimal places.

$$\begin{array}{r} 4.23 \\ \times\ \ 0.3 \\ \hline 1.269 \end{array}$$

b. The first factor has 3 decimal places. The second factor has 2 decimal places. Insert the decimal point in the product so that there are 3 + 2 = 5 decimal places. Insert two zeros to the right of the decimal point to obtain 5 decimal places.

$$\begin{array}{r} 0.444 \\ \times\ \ 0.02 \\ \hline 0.00888 \end{array}$$

c. The first factor has 2 decimal places. The second factor has 0 decimal places. Insert the decimal point in the product so that there are 2 + 0 = 2 decimal places.

$$\begin{array}{r} 5.72 \\ \times 46 \\ \hline 3432 \\ +\ 22880 \\ \hline 263.12 \end{array}$$

8. The amount that you will have left is your original amount, $80.00, minus the cost of the chuck roast and the shrimp. Let's begin with the cost of the chuck roast ($14.26) and the cost of the shrimp (five pounds at $6.19 per pound).

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Cost of food = cost of chuck roast + cost of shrimp

$$= 14.26 + 5 \times 6.19$$
$$= 14.26 + 30.95$$
$$= 45.21$$

$$\begin{array}{r} 6.19 \\ \times \quad 5 \\ \hline 30.95 \end{array}$$

The cost of the combined chuck roast and shrimp is \$45.21.

Amount you have left = original budget − cost of food

$$= 80.00 - 45.21$$
$$= 34.79$$

You will have \$34.79 of your food budget left.

9.
$$\begin{array}{r} 37.4 \\ 6\overline{)224.4} \\ \underline{18} \\ 44 \\ \underline{42} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

Check:
$$\begin{array}{r} 37.4 \\ \times \quad 6 \\ \hline 224.4 \end{array}$$

10.
$$\begin{array}{r} 0.56 \\ 34\overline{)19.04} \\ \underline{170} \\ 204 \\ \underline{204} \\ 0 \end{array}$$

Check:
$$\begin{array}{r} 34 \\ \times 0.56 \\ \hline 204 \\ +1700 \\ \hline 19.04 \end{array}$$

11.
$$\begin{array}{r} 2.015 \\ 8\overline{)16.120} \\ \underline{16} \\ 01 \\ \underline{0} \\ 12 \\ \underline{8} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

Check:
$$\begin{array}{r} 2.015 \\ \times \quad 8 \\ \hline 16.120 \end{array}$$

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12. $11.5 \div 6 = 1.91\overline{6}$ $\left(\text{or } 1.91666...\right)$

$$
\begin{array}{r}
1.91666\ldots \\
6\overline{)11.50000} \\
\underline{6} \\
55 \\
\underline{54} \\
10 \\
\underline{6} \\
40 \\
\underline{36} \\
40 \\
\underline{36} \\
40 \\
\underline{36} \\
4
\end{array}
$$

13. We move the decimal point in the divisor and the dividend one place to the right so that the divisor is a whole number.

$5.8\overline{)36.366}$ becomes $58.\overline{)363.66}$

$$
\begin{array}{r}
6.27 \\
\underline{348} \\
156 \\
\underline{116} \\
406 \\
\underline{406} \\
0
\end{array}
$$

The quotient is 6.27, a terminating decimal.

14. We move the decimal point in the divisor and the dividend two places to the right so that the divisor is a whole number.

$0.18\overline{)10.48}$ becomes $18.\overline{)1048.}$

$$
\begin{array}{r}
58. \\
\underline{90} \\
148 \\
\underline{144} \\
4
\end{array}
$$

All of the digits in the dividend have been used, but the remainder is not 0. We will write zeros after the decimal point in the dividend to allow the division to continue.

$$
\begin{array}{r}
58.222 \\
18.\overline{)1048.000} \\
\underline{90} \\
148 \\
\underline{144} \\
40 \\
\underline{36} \\
40 \\
\underline{36} \\
40 \\
\underline{36} \\
4
\end{array}
$$

The digit 2 in the quotient keeps repeating.

Thus, $10.48 \div 0.18 = 58.\overline{2}$ $\left(\text{or } 58.222...\right)$.

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15. We move the decimal point in the divisor and the dividend two places to the right so that the divisor is a whole number. Then we divide and round the quotient to the nearest hundredth. Because we are rounding to the nearest hundredth, carry the division process to one more decimal place, the thousandth place.

$$0.38\overline{)19.6} \quad \text{becomes} \quad 38.\overline{)1960.000}$$

$$\begin{array}{r} 51.578 \\ 38.\overline{)1960.000} \\ \underline{190} \\ 60 \\ \underline{38} \\ 220 \\ \underline{190} \\ 300 \\ \underline{266} \\ 340 \\ \underline{304} \\ 36 \end{array}$$

Now round to the nearest hundredth: $51.578 \approx 51.58$.

16. Subtract the amount paid in cash ($850.00) from the cost of the television ($2740.85). This result is the amount still to be paid, or the balance. To find the monthly payment, divide the balance by the number of equal payments (12).

$$\text{Monthly payment} = \frac{2740.85 - 850.00}{12} = \frac{1890.85}{12} \approx 157.57$$

The amount of each monthly payment is $157.57.

Concept and Vocabulary Check P.5

1. decimal points; 0

2. minuend; subtrahend; difference

3. 4.1; 1.2; 5.3

4. 4

5. 3

6. 6

7. 1.35

8. 5.6

9. 000.04 or 0.04

10. 83. or 83

11. $19.\overline{26}$

12. $19.2\overline{6}$

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