

Prealgebra Textbook

Second Edition

Chapter 7 Odd Solutions

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College of the Redwoods

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Percent

7.1 Percent, Decimals, Fractions

1.

$$\begin{aligned}4\frac{7}{10}\% &= \frac{4\frac{7}{10}}{100} \\ &= \frac{\frac{47}{10}}{100} \\ &= \frac{47}{10} \cdot \frac{1}{100} \\ &= \frac{47}{1000}\end{aligned}$$

Percent: parts per hundred.

Mixed to improper fraction.

Invert and multiply.

Simplify.

3.

$$\begin{aligned}7\frac{2}{9}\% &= \frac{7\frac{2}{9}}{100} \\ &= \frac{\frac{65}{9}}{100} \\ &= \frac{65}{9} \cdot \frac{1}{100} \\ &= \frac{13}{180}\end{aligned}$$

Percent: parts per hundred.

Mixed to improper fraction.

Invert and multiply.

Simplify.

5.

$$\begin{aligned}
 11.76\% &= \frac{11.76}{100} \\
 &= \frac{11.76 \cdot 100}{100 \cdot 100} \\
 &= \frac{1176}{10000} \\
 &= \frac{147}{1250}
 \end{aligned}$$

Percent: parts per hundred.

Multiply numerator and denominator by 100.

Multiply.

Reduce.

7.

$$\begin{aligned}
 13.99\% &= \frac{13.99}{100} \\
 &= \frac{13.99 \cdot 100}{100 \cdot 100} \\
 &= \frac{1399}{10000}
 \end{aligned}$$

Percent: parts per hundred.

Multiply numerator and denominator by 100.

Multiply.

9.

$$\begin{aligned}
 4\frac{1}{2}\% &= \frac{4\frac{1}{2}}{100} \\
 &= \frac{\frac{9}{2}}{100} \\
 &= \frac{9}{2} \cdot \frac{1}{100} \\
 &= \frac{9}{200}
 \end{aligned}$$

Percent: parts per hundred.

Mixed to improper fraction.

Invert and multiply.

Simplify.

11.

$$\begin{aligned}
 192\% &= \frac{192}{100} \\
 &= \frac{48}{25}
 \end{aligned}$$

Percent: parts per hundred.

Reduce.

13.

$$\begin{aligned}
 86\% &= \frac{86}{100} \\
 &= \frac{43}{50}
 \end{aligned}$$

Percent: parts per hundred.

Reduce.

15.

$$\begin{aligned} 130\% &= \frac{130}{100} && \text{Percent: parts per hundred.} \\ &= \frac{13}{10} && \text{Reduce.} \end{aligned}$$

17.

$$\begin{aligned} 4.07\% &= \frac{4.07}{100} && \text{Percent: parts per hundred.} \\ &= \frac{4.07 \cdot 100}{100 \cdot 100} && \text{Multiply numerator and denominator by 100.} \\ &= \frac{407}{10000} && \text{Multiply.} \end{aligned}$$

19. Move the decimal point two places to the left: $124\% = 1.24$ **21.** Move the decimal point two places to the left: $0.6379\% = 0.006379$ **23.** Move the decimal point two places to the left: $28\% = 0.28$ **25.** Move the decimal point two places to the left: $0.83\% = 0.0083$ **27.** Move the decimal point two places to the left: $8\% = 0.08$ **29.** Move the decimal point two places to the left: $59.84\% = 0.5984$ **31.** Move the decimal point two places to the left: $155\% = 1.55$ **33.** Move the decimal point two places to the left: $36.5\% = 0.365$ **35.** Move the decimal point two places to the right: $8.888 = 888.8\%$ **37.** Move the decimal point two places to the right: $0.85 = 85\%$

39. Move the decimal point two places to the right: $1.681 = 168.1\%$

41. Move the decimal point two places to the right: $0.14 = 14\%$

43. Move the decimal point two places to the right: $8.7 = 870\%$

45. Move the decimal point two places to the right: $0.38 = 38\%$

47. Move the decimal point two places to the right: $0.02 = 2\%$

49. Move the decimal point two places to the right: $0.044 = 4.4\%$

51. Change $1/2$ to a decimal, then change the decimal to a percent:

$$\begin{aligned} \frac{1}{2} &= 0.5 && \text{Divide.} \\ &= 50\% && \text{Move the decimal point two places to the right.} \end{aligned}$$

Alternate solution: First create an equivalent fraction for $1/2$ with a denominator of 100:

$$\frac{1}{2} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{aligned} 2x &= 100 && \text{Cross multiply.} \\ \frac{2x}{2} &= \frac{100}{2} && \text{Divide both sides by 2.} \\ x &= 50 && \text{Divide.} \end{aligned}$$

$$\text{Thus, } \frac{1}{2} = \frac{50}{100} = 50\%.$$

53. Change $5/2$ to a decimal, then change the decimal to a percent:

$$\begin{aligned} \frac{5}{2} &= 2.5 && \text{Divide.} \\ &= 250\% && \text{Move the decimal point two places to the right.} \end{aligned}$$

Alternate solution: First create an equivalent fraction for $5/2$ with a denominator of 100:

$$\frac{5}{2} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{array}{ll} 2x = 500 & \text{Cross multiply.} \\ \frac{2x}{2} = \frac{500}{2} & \text{Divide both sides by 2.} \\ x = 250 & \text{Divide.} \end{array}$$

Thus, $\frac{5}{2} = \frac{250}{100} = 250\%$.

55. Change $8/5$ to a decimal, then change the decimal to a percent:

$$\begin{array}{ll} \frac{8}{5} = 1.6 & \text{Divide.} \\ = 160\% & \text{Move the decimal point two places to the right.} \end{array}$$

Alternate solution: First create an equivalent fraction for $8/5$ with a denominator of 100:

$$\frac{8}{5} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{array}{ll} 5x = 800 & \text{Cross multiply.} \\ \frac{5x}{5} = \frac{800}{5} & \text{Divide both sides by 5.} \\ x = 160 & \text{Divide.} \end{array}$$

Thus, $\frac{8}{5} = \frac{160}{100} = 160\%$.

57. Change $14/5$ to a decimal, then change the decimal to a percent:

$$\begin{array}{ll} \frac{14}{5} = 2.8 & \text{Divide.} \\ = 280\% & \text{Move the decimal point two places to the right.} \end{array}$$

Alternate solution: First create an equivalent fraction for $14/5$ with a denominator of 100:

$$\frac{14}{5} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{array}{ll} 5x = 1400 & \text{Cross multiply.} \\ \frac{5x}{5} = \frac{1400}{5} & \text{Divide both sides by 5.} \\ x = 280 & \text{Divide.} \end{array}$$

Thus, $\frac{14}{5} = \frac{280}{100} = 280\%$.

59. Change $9/2$ to a decimal, then change the decimal to a percent:

$$\begin{aligned}\frac{9}{2} &= 4.5 && \text{Divide.} \\ &= 450\% && \text{Move the decimal point two places to the right.}\end{aligned}$$

Alternate solution: First create an equivalent fraction for $9/2$ with a denominator of 100:

$$\frac{9}{2} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{aligned}2x &= 900 && \text{Cross multiply.} \\ \frac{2x}{2} &= \frac{900}{2} && \text{Divide both sides by 2.} \\ x &= 450 && \text{Divide.}\end{aligned}$$

$$\text{Thus, } \frac{9}{2} = \frac{450}{100} = 450\%.$$

61. Change $9/4$ to a decimal, then change the decimal to a percent:

$$\begin{aligned}\frac{9}{4} &= 2.25 && \text{Divide.} \\ &= 225\% && \text{Move the decimal point two places to the right.}\end{aligned}$$

Alternate solution: First create an equivalent fraction for $9/4$ with a denominator of 100:

$$\frac{9}{4} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{aligned}4x &= 900 && \text{Cross multiply.} \\ \frac{4x}{4} &= \frac{900}{4} && \text{Divide both sides by 4.} \\ x &= 225 && \text{Divide.}\end{aligned}$$

$$\text{Thus, } \frac{9}{4} = \frac{225}{100} = 225\%.$$

63. Change $7/5$ to a decimal, then change the decimal to a percent:

$$\begin{aligned}\frac{7}{5} &= 1.4 && \text{Divide.} \\ &= 140\% && \text{Move the decimal point two places to the right.}\end{aligned}$$

Alternate solution: First create an equivalent fraction for $7/5$ with a denominator of 100:

$$\frac{7}{5} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{array}{ll} 5x = 700 & \text{Cross multiply.} \\ \frac{5x}{5} = \frac{700}{5} & \text{Divide both sides by 5.} \\ x = 140 & \text{Divide.} \end{array}$$

Thus, $\frac{7}{5} = \frac{140}{100} = 140\%$.

65. Change $6/5$ to a decimal, then change the decimal to a percent:

$$\begin{array}{ll} \frac{6}{5} = 1.2 & \text{Divide.} \\ = 120\% & \text{Move the decimal point two places to the right.} \end{array}$$

Alternate solution: First create an equivalent fraction for $6/5$ with a denominator of 100:

$$\frac{6}{5} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{array}{ll} 5x = 600 & \text{Cross multiply.} \\ \frac{5x}{5} = \frac{600}{5} & \text{Divide both sides by 5.} \\ x = 120 & \text{Divide.} \end{array}$$

Thus, $\frac{6}{5} = \frac{120}{100} = 120\%$.

67. Change $12/5$ to a decimal, then change the decimal to a percent:

$$\begin{array}{ll} \frac{12}{5} = 2.4 & \text{Divide.} \\ = 240\% & \text{Move the decimal point two places to the right.} \end{array}$$

Alternate solution: First create an equivalent fraction for $12/5$ with a denominator of 100:

$$\frac{12}{5} = \frac{x}{100}$$

Then solve this proportion for x :

$$5x = 1200$$

Cross multiply.

$$\frac{5x}{5} = \frac{1200}{5}$$

Divide both sides by 5.

$$x = 240$$

Divide.

$$\text{Thus, } \frac{12}{5} = \frac{240}{100} = 240\%.$$

69. First compute an approximate decimal equivalent of the fraction $24/29$ by dividing. We will be moving the decimal point two places to the right and then rounding, so the division must be carried out to five decimal places. By division,

$$\frac{24}{29} \approx 0.82759$$

Now move the decimal point two places to the right:

$$0.82759 = 82.759\%$$

To round to the nearest hundredth of a percent, identify the rounding and test digits.

$$82.7\boxed{5}\boxed{9}\%$$

↑ Rounding digit ↓ Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit and truncate:

$$82.759\% \approx 82.76\%$$

$$\text{Thus, } \frac{24}{29} \approx 82.76\%.$$

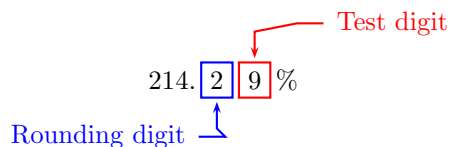
71. First compute an approximate decimal equivalent of the fraction $15/7$ by dividing. We will be moving the decimal point two places to the right and then rounding, so the division must be carried out to four decimal places. By division,

$$\frac{15}{7} \approx 2.1429$$

Now move the decimal point two places to the right:

$$2.1429 = 214.29\%$$

To round to the nearest tenth of a percent, identify the rounding and test digits.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit and truncate:

$$214.29\% \approx 214.3\%$$

Thus, $\frac{15}{7} \approx 214.3\%$.

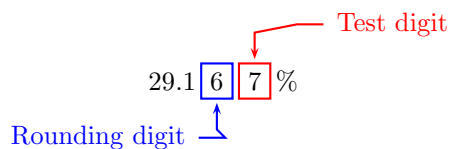
73. First compute an approximate decimal equivalent of the fraction $7/24$ by dividing. We will be moving the decimal point two places to the right and then rounding, so the division must be carried out to five decimal places. By division,

$$\frac{7}{24} \approx 0.29167$$

Now move the decimal point two places to the right:

$$0.29167 = 29.167\%$$

To round to the nearest hundredth of a percent, identify the rounding and test digits.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit and truncate:

$$29.167\% \approx 29.17\%$$

Thus, $\frac{7}{24} \approx 29.17\%$.

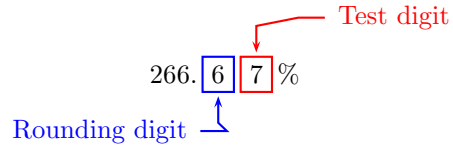
75. First compute an approximate decimal equivalent of the fraction $8/3$ by dividing. We will be moving the decimal point two places to the right and then rounding, so the division must be carried out to four decimal places. By division,

$$\frac{8}{3} \approx 2.6667$$

Now move the decimal point two places to the right:

$$2.6667 = 266.67\%$$

To round to the nearest tenth of a percent, identify the rounding and test digits.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit and truncate:

$$266.67\% \approx 266.7\%$$

Thus, $\frac{8}{3} \approx 266.7\%$.

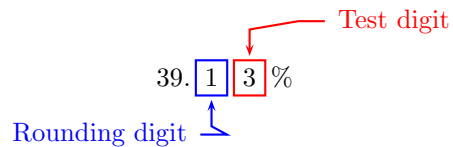
77. First compute an approximate decimal equivalent of the fraction $9/23$ by dividing. We will be moving the decimal point two places to the right and then rounding, so the division must be carried out to four decimal places. By division,

$$\frac{9}{23} \approx 0.3913$$

Now move the decimal point two places to the right:

$$0.3913 = 39.13\%$$

To round to the nearest tenth of a percent, identify the rounding and test digits.



Because the test digit is less than 5, leave the rounding digit alone and then truncate:

$$39.13\% \approx 39.1\%$$

Thus, $\frac{9}{23} \approx 39.1\%$.

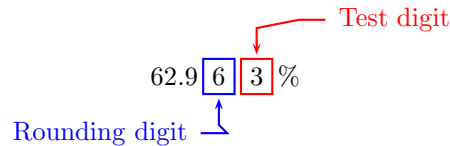
79. First compute an approximate decimal equivalent of the fraction $17/27$ by dividing. We will be moving the decimal point two places to the right and then rounding, so the division must be carried out to five decimal places. By division,

$$\frac{17}{27} \approx 0.62963$$

Now move the decimal point two places to the right:

$$0.62963 = 62.963\%$$

To round to the nearest hundredth of a percent, identify the rounding and test digits.



Because the test digit is less than 5, leave the rounding digit alone and then truncate:

$$62.963\% \approx 62.96\%$$

Thus, $\frac{17}{27} \approx 62.96\%$.

81.

- i) The negative signs indicate the crime rate has *decreased* from previous measures.
- ii) To find the largest decrease, find the largest magnitude. The largest magnitude will indicate the largest change. The absolute value of percent change in motor vehicle theft at 18.75% is the largest magnitude listed. Therefore, motor vehicle theft decreased the most.
- iii) To find the smallest change from previous measures, find the smallest magnitude. The smallest absolute value corresponds to the percent change in burglaries at 2.5%. Therefore, burglary crimes went down the least amount.

83.

- i) Change $1/25$ to a decimal, then change the decimal to a percent:

$$\begin{aligned} \frac{1}{25} &= 0.04 && \text{Divide.} \\ &= 4\% && \text{Move the decimal point two places to the right.} \end{aligned}$$

Alternate solution: First create an equivalent fraction for $1/25$ with a denominator of 100:

$$\frac{1}{25} = \frac{x}{100}$$

Then solve this proportion for x :

$$25x = 100 \quad \text{Cross multiply.}$$

$$\frac{25x}{25} = \frac{100}{25} \quad \text{Divide both sides by 25.}$$

$$x = 4 \quad \text{Divide.}$$

$$\text{Thus, } \frac{1}{25} = \frac{4}{100} = 4\%.$$

ii) Change $1/32$ to a decimal, then change the decimal to a percent:

$$\frac{1}{32} = 0.03125 \quad \text{Divide.}$$

$$\approx 3.1\% \quad \text{Move the decimal point two places to the right.}$$

Alternate solution: First create an equivalent fraction for $1/32$ with a denominator of 100:

$$\frac{1}{32} = \frac{x}{100}$$

Then solve this proportion for x :

$$32x = 100 \quad \text{Cross multiply.}$$

$$\frac{32x}{32} = \frac{100}{32} \quad \text{Divide both sides by 32.}$$

$$x = 3.125 \quad \text{Divide.}$$

$$\text{Thus, } \frac{1}{32} = \frac{3.125}{100} \approx 3.1\% \text{ rounded to the nearest tenth of a percent.}$$

iii) Change $1/4$ to a decimal, then change the decimal to a percent:

$$\frac{1}{4} = 0.25 \quad \text{Divide.}$$

$$= 25\% \quad \text{Move the decimal point two places to the right.}$$

Alternate solution: First create an equivalent fraction for $1/4$ with a denominator of 100:

$$\frac{1}{4} = \frac{x}{100}$$

Then solve this proportion for x :

$$4x = 100 \quad \text{Cross multiply.}$$

$$\frac{4x}{4} = \frac{100}{4} \quad \text{Divide both sides by 4.}$$

$$x = 25 \quad \text{Divide.}$$

$$\text{Thus, } \frac{1}{4} = \frac{25}{100} = 25\%.$$

iv) Change $1/140$ to a decimal, then change the decimal to a percent:

$$\begin{aligned} \frac{1}{140} &= 0.0071 && \text{Divide.} \\ &\approx 0.7\% && \text{Move the decimal point two places to the right.} \end{aligned}$$

Alternate solution: First create an equivalent fraction for $1/140$ with a denominator of 100:

$$\frac{1}{140} = \frac{x}{100}$$

Then solve this proportion for x :

$$\begin{aligned} 140x &= 100 && \text{Cross multiply.} \\ \frac{140x}{140} &= \frac{100}{140} && \text{Divide both sides by 140.} \\ x &\approx 0.7 && \text{Divide.} \end{aligned}$$

$$\text{Thus, } \frac{1}{140} \approx \frac{0.7}{100} = 0.7\%.$$

7.2 Solving Basic Percent Problems

1.

$$\begin{aligned} x &= 22.4\% \cdot 125 && \text{Set up an equation.} \\ x &= (0.224)(125) && \text{Convert the percent to a decimal.} \\ x &= 28 && \text{Multiply.} \end{aligned}$$

3.

$$\begin{aligned} 60\% \cdot x &= 90 && \text{Set up an equation.} \\ 0.6x &= 90 && \text{Convert the percent to a decimal.} \\ x &= \frac{90}{0.6} && \text{Divide both sides by 0.6.} \\ x &= 150 && \text{Simplify.} \end{aligned}$$

5.

$$200\% \cdot x = 132$$

$$2x = 132$$

$$x = \frac{132}{2}$$

$$x = 66$$

Set up an equation.

Convert the percent to a decimal.

Divide both sides by 2.

Simplify.

7.

$$162.5\% \cdot x = 195$$

$$1.625x = 195$$

$$x = \frac{195}{1.625}$$

$$x = 120$$

Set up an equation.

Convert the percent to a decimal.

Divide both sides by 1.625.

Simplify.

9.

$$126.4\% \cdot x = 158$$

$$1.264x = 158$$

$$x = \frac{158}{1.264}$$

$$x = 125$$

Set up an equation.

Convert the percent to a decimal.

Divide both sides by 1.264.

Simplify.

11.

$$27 = 45 \cdot x$$

$$x = \frac{27}{45}$$

$$x = 0.6$$

$$x = 60\%$$

Set up an equation.

Divide both sides by 45.

Simplify.

Convert the decimal to percent.

13.

$$37.5\% \cdot x = 57$$

$$0.375x = 57$$

$$x = \frac{57}{0.375}$$

$$x = 152$$

Set up an equation.

Convert the percent to a decimal.

Divide both sides by 0.375.

Simplify.

15.

$$x = 85\% \cdot 100$$

$$x = (0.85)(100)$$

$$x = 85$$

Set up an equation.

Convert the percent to a decimal.

Multiply.

17.

$$x = 200\% \cdot 15$$

$$x = (2)(15)$$

$$x = 30$$

Set up an equation.

Convert the percent to a decimal.

Multiply.

19.

$$50\% \cdot x = 58$$

$$0.5x = 58$$

$$x = \frac{58}{0.5}$$

$$x = 116$$

Set up an equation.

Convert the percent to a decimal.

Divide both sides by 0.5.

Simplify.

21.

$$5.6 = 40 \cdot x$$

$$x = \frac{5.6}{40}$$

$$x = 0.14$$

$$x = 14\%$$

Set up an equation.

Divide both sides by 40.

Simplify.

Convert the decimal to percent.

23.

$$\begin{aligned}x &= 18.4\% \cdot 125 \\x &= (0.184)(125) \\x &= 23\end{aligned}$$

Set up an equation.
Convert the percent to a decimal.
Multiply.

25.

$$\begin{aligned}30.8 &= 40 \cdot x \\x &= \frac{30.8}{40} \\x &= 0.77 \\x &= 77\%\end{aligned}$$

Set up an equation.
Divide both sides by 40.
Simplify.
Convert the decimal to percent.

27.

$$\begin{aligned}7.2 &= 16 \cdot x \\x &= \frac{7.2}{16} \\x &= 0.45 \\x &= 45\%\end{aligned}$$

Set up an equation.
Divide both sides by 16.
Simplify.
Convert the decimal to percent.

29.

$$\begin{aligned}x &= 89.6\% \cdot 125 \\x &= (0.896)(125) \\x &= 112\end{aligned}$$

Set up an equation.
Convert the percent to a decimal.
Multiply.

31.

$$\begin{aligned}60 &= 80 \cdot x \\x &= \frac{60}{80} \\x &= 0.75 \\x &= 75\%\end{aligned}$$

Set up an equation.
Divide both sides by 80.
Simplify.
Convert the decimal to percent.

33.

$$\begin{array}{ll}
 x = 200\% \cdot 11 & \text{Set up an equation.} \\
 x = (2)(11) & \text{Convert the percent to a decimal.} \\
 x = 22 & \text{Multiply.}
 \end{array}$$

35.

$$\begin{array}{ll}
 27 = 18 \cdot x & \text{Set up an equation.} \\
 x = \frac{27}{18} & \text{Divide both sides by 18.} \\
 x = 1.5 & \text{Simplify.} \\
 x = 150\% & \text{Convert the decimal to percent.}
 \end{array}$$

37. First convert the mixed fraction percent to an improper fraction:

$$\begin{array}{ll}
 133\frac{1}{3}\% = \frac{133\frac{1}{3}}{100} & \text{Percent: parts per hundred.} \\
 = \frac{\frac{400}{3}}{100} & \text{Mixed to improper fraction.} \\
 = \frac{400}{3} \cdot \frac{1}{100} & \text{Invert and multiply.} \\
 = \frac{4}{3} & \text{Simplify.}
 \end{array}$$

Then set up and solve the appropriate equation:

$$\begin{array}{ll}
 133\frac{1}{3}\% \cdot x = 80 & \text{Set up an equation.} \\
 \frac{4}{3}x = 80 & \text{Rewrite using the improper fraction computed above.} \\
 4x = 80 \cdot 3 & \text{Multiply both sides by 3.} \\
 4x = 240 & \text{Simplify.} \\
 x = \frac{240}{4} & \text{Divide both sides by 4.} \\
 x = 60 & \text{Simplify.}
 \end{array}$$

39. First convert the mixed fraction percent to an improper fraction:

$$\begin{aligned}
 54\frac{1}{3}\% &= \frac{54\frac{1}{3}}{100} && \text{Percent: parts per hundred.} \\
 &= \frac{\frac{163}{3}}{100} && \text{Mixed to improper fraction.} \\
 &= \frac{163}{3} \cdot \frac{1}{100} && \text{Invert and multiply.} \\
 &= \frac{163}{300} && \text{Simplify.}
 \end{aligned}$$

Then set up and solve the appropriate equation:

$$\begin{aligned}
 x &= 54\frac{1}{3}\% \cdot 6 && \text{Set up an equation.} \\
 x &= \frac{163}{300} \cdot 6 && \text{Rewrite using the improper fraction computed above.} \\
 x &= \frac{978}{300} && \text{Multiply numerators and denominators.} \\
 x &= 3.26 && \text{Divide.}
 \end{aligned}$$

41. First convert the mixed fraction percent to an improper fraction:

$$\begin{aligned}
 62\frac{1}{2}\% &= \frac{62\frac{1}{2}}{100} && \text{Percent: parts per hundred.} \\
 &= \frac{\frac{125}{2}}{100} && \text{Mixed to improper fraction.} \\
 &= \frac{125}{2} \cdot \frac{1}{100} && \text{Invert and multiply.} \\
 &= \frac{5}{8} && \text{Simplify.}
 \end{aligned}$$

Then set up and solve the appropriate equation:

$$\begin{aligned}
 x &= 62\frac{1}{2}\% \cdot 32 && \text{Set up an equation.} \\
 x &= \frac{5}{8} \cdot 32 && \text{Rewrite using the improper fraction computed above.} \\
 x &= \frac{160}{8} && \text{Multiply numerators and denominators.} \\
 x &= 20 && \text{Divide.}
 \end{aligned}$$

43. First convert the mixed fraction percent to an improper fraction:

$$\begin{aligned}
 77\frac{1}{7}\% &= \frac{77\frac{1}{7}}{100} && \text{Percent: parts per hundred.} \\
 &= \frac{\frac{540}{7}}{100} && \text{Mixed to improper fraction.} \\
 &= \frac{540}{7} \cdot \frac{1}{100} && \text{Invert and multiply.} \\
 &= \frac{27}{35} && \text{Simplify.}
 \end{aligned}$$

Then set up and solve the appropriate equation:

$$\begin{aligned}
 77\frac{1}{7}\% \cdot x &= 27 && \text{Set up an equation.} \\
 \frac{27}{35}x &= 27 && \text{Rewrite using the improper fraction computed above.} \\
 27x &= 27 \cdot 35 && \text{Multiply both sides by 35.} \\
 27x &= 945 && \text{Simplify.} \\
 x &= \frac{945}{27} && \text{Divide both sides by 27.} \\
 x &= 35 && \text{Simplify.}
 \end{aligned}$$

45. First convert the mixed fraction percent to an improper fraction:

$$\begin{aligned}
 142\frac{6}{7}\% &= \frac{142\frac{6}{7}}{100} && \text{Percent: parts per hundred.} \\
 &= \frac{\frac{1000}{7}}{100} && \text{Mixed to improper fraction.} \\
 &= \frac{1000}{7} \cdot \frac{1}{100} && \text{Invert and multiply.} \\
 &= \frac{10}{7} && \text{Simplify.}
 \end{aligned}$$

Then set up and solve the appropriate equation:

$$\begin{aligned}
 x &= 142\frac{6}{7}\% \cdot 77 && \text{Set up an equation.} \\
 x &= \frac{10}{7} \cdot 77 && \text{Rewrite using the improper fraction computed above.} \\
 x &= \frac{770}{7} && \text{Multiply numerators and denominators.} \\
 x &= 110 && \text{Divide.}
 \end{aligned}$$

47.

$$143\frac{1}{2}\% \cdot x = 5.74 \quad \text{Set up an equation.}$$

$$143.5\% \cdot x = 5.74 \quad \text{Convert the mixed fraction to an exact decimal.}$$

$$1.435x = 5.74 \quad \text{Convert the percent to an decimal.}$$

$$x = \frac{5.74}{1.435} \quad \text{Divide both sides by 1.435.}$$

$$x = 4 \quad \text{Simplify.}$$

49. First convert the mixed fraction percent to an improper fraction:

$$141\frac{2}{3}\% = \frac{141\frac{2}{3}}{100} \quad \text{Percent: parts per hundred.}$$

$$= \frac{\frac{425}{3}}{100} \quad \text{Mixed to improper fraction.}$$

$$= \frac{425}{3} \cdot \frac{1}{100} \quad \text{Invert and multiply.}$$

$$= \frac{17}{12} \quad \text{Simplify.}$$

Then set up and solve the appropriate equation:

$$141\frac{2}{3}\% \cdot x = 68 \quad \text{Set up an equation.}$$

$$\frac{17}{12}x = 68 \quad \text{Rewrite using the improper fraction computed above.}$$

$$17x = 68 \cdot 12 \quad \text{Multiply both sides by 12.}$$

$$17x = 816 \quad \text{Simplify.}$$

$$x = \frac{816}{17} \quad \text{Divide both sides by 17.}$$

$$x = 48 \quad \text{Simplify.}$$

51. First convert the mixed fraction percent to an improper fraction:

$$66\frac{2}{3}\% = \frac{66\frac{2}{3}}{100} \quad \text{Percent: parts per hundred.}$$

$$= \frac{\frac{200}{3}}{100} \quad \text{Mixed to improper fraction.}$$

$$= \frac{200}{3} \cdot \frac{1}{100} \quad \text{Invert and multiply.}$$

$$= \frac{2}{3} \quad \text{Simplify.}$$

Then set up and solve the appropriate equation:

$$x = 66\frac{2}{3}\% \cdot 96 \quad \text{Set up an equation.}$$

$$x = \frac{2}{3} \cdot 96 \quad \text{Rewrite using the improper fraction computed above.}$$

$$x = \frac{192}{3} \quad \text{Multiply numerators and denominators.}$$

$$x = 64 \quad \text{Divide.}$$

53.

$$59\frac{1}{2}\% \cdot x = 2.38 \quad \text{Set up an equation.}$$

$$59.5\% \cdot x = 2.38 \quad \text{Convert the mixed fraction to an exact decimal.}$$

$$0.595x = 2.38 \quad \text{Convert the percent to an decimal.}$$

$$x = \frac{2.38}{0.595} \quad \text{Divide both sides by 0.595.}$$

$$x = 4 \quad \text{Simplify.}$$

55.

$$78\frac{1}{2}\% \cdot x = 7.85 \quad \text{Set up an equation.}$$

$$78.5\% \cdot x = 7.85 \quad \text{Convert the mixed fraction to an exact decimal.}$$

$$0.785x = 7.85 \quad \text{Convert the percent to an decimal.}$$

$$x = \frac{7.85}{0.785} \quad \text{Divide both sides by 0.785.}$$

$$x = 10 \quad \text{Simplify.}$$

57. First convert the mixed fraction percent to an improper fraction:

$$56\frac{2}{3}\% = \frac{56\frac{2}{3}}{100} \quad \text{Percent: parts per hundred.}$$

$$= \frac{\frac{170}{3}}{100} \quad \text{Mixed to improper fraction.}$$

$$= \frac{170}{3} \cdot \frac{1}{100} \quad \text{Invert and multiply.}$$

$$= \frac{17}{30} \quad \text{Simplify.}$$

Then set up and solve the appropriate equation:

$$x = 56\frac{2}{3}\% \cdot 51 \quad \text{Set up an equation.}$$

$$x = \frac{17}{30} \cdot 51 \quad \text{Rewrite using the improper fraction computed above.}$$

$$x = \frac{867}{30} \quad \text{Multiply numerators and denominators.}$$

$$x = 28.9 \quad \text{Divide.}$$

59. First convert the mixed fraction percent to an improper fraction:

$$87\frac{1}{2}\% = \frac{87\frac{1}{2}}{100} \quad \text{Percent: parts per hundred.}$$

$$= \frac{\frac{175}{2}}{100} \quad \text{Mixed to improper fraction.}$$

$$= \frac{175}{2} \cdot \frac{1}{100} \quad \text{Invert and multiply.}$$

$$= \frac{7}{8} \quad \text{Simplify.}$$

Then set up and solve the appropriate equation:

$$x = 87\frac{1}{2}\% \cdot 70 \quad \text{Set up an equation.}$$

$$x = \frac{7}{8} \cdot 70 \quad \text{Rewrite using the improper fraction computed above.}$$

$$x = \frac{490}{8} \quad \text{Multiply numerators and denominators.}$$

$$x = 61.25 \quad \text{Divide.}$$

61. Let r represent the revenue received by the dairy farmer. In words, the “revenue received by the dairy farmer is 20% of the retail price.” In symbols, this translates to

$$r = 20\% \cdot 3.80$$

Change 20% to a decimal, then multiply.

$$r = 0.20 \cdot 3.80 \quad 20\% = 0.20.$$

$$r = 0.76 \quad 0.20 \cdot 3.80 = 0.76.$$

Hence, the dairy farmer receives \$0.76.

7.3 General Applications of Percent

1. Let p represent the percent of the percent of the solution that is sulphuric acid. Then we can translate the problem statement into words and symbols.

Amount of sulphuric acid	is	what percent	of	the total amount of solution
31	=	p	·	250

Because multiplication is commutative, we can write the right-hand side of the last equation as follows.

$$31 = 250p$$

Divide both sides by 250. Carry the division to four decimal places.

$$\frac{31}{250} = \frac{250p}{250} \quad \text{Divide both sides by 250.}$$

$$0.1240 \approx p \quad \text{Divide to 4 places.}$$

To change this result to a percent, Move the decimal two places to the right and append a percent symbol.

$$p \approx 12.40\%$$

Now round to the nearest tenth of a percent.

$$12.\boxed{4}\boxed{0}\%$$

↑ Rounding digit ↘ Test digit

Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, correct to the nearest tenth of a percent,

$$p \approx 12.4\%$$

3. Let p represent the percent of the trip already completed. Then we can translate the problem statement into words and symbols.

Miles completed	is	what percent	of	the total trip
186	=	p	·	346

Because multiplication is commutative, we can write the right-hand side of the last equation as follows.

$$186 = 346p$$

Divide both sides by 346. Carry the division to three decimal places.

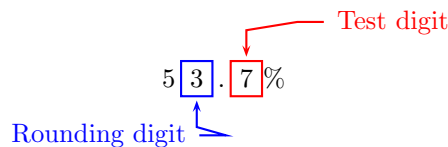
$$\frac{186}{346} = \frac{346p}{346} \quad \text{Divide both sides by 346.}$$

$$0.537 \approx p \quad \text{Divide to 3 places.}$$

To change this result to a percent, move the decimal two places to the right and append a percent symbol.

$$p \approx 53.7\%$$

Now round to the nearest percent.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, correct to the nearest percent,

$$p \approx 54\%.$$

5. Let p represent the percent of the class that is present. Then we can translate the problem statement into words and symbols.

Present	is	what percent	of	class size
19	=	p	·	34

Because multiplication is commutative, we can write the right-hand side of the last equation as follows.

$$19 = 34p$$

Divide both sides by 34. Carry the division to three decimal places.

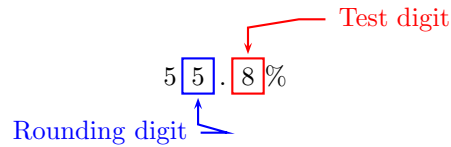
$$\frac{19}{34} = \frac{34p}{34} \quad \text{Divide both sides by 34.}$$

$$0.558 \approx p \quad \text{Divide to 3 places.}$$

To change this result to a percent, move the decimal two places to the right and append a percent symbol.

$$p \approx 55.8\%$$

Now round to the nearest percent.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, correct to the nearest percent,

$$p \approx 56\%.$$

7. Let p represent the percent of the total number of questions marked correctly. Then we can translate the problem statement into words and symbols.

Number of correct answers	is	what percent	of	total number of questions
135	=	p	·	150

Because multiplication is commutative, we can write the last equation in the form

$$135 = 150p.$$

Solve for p .

$$\frac{135}{150} = \frac{150p}{150} \quad \text{Divide both sides by 150.}$$

$$\frac{9}{10} = p \quad \text{Reduce: } 135/150 = 9/10.$$

We need to change $p = 9/10$ to a percent. Divide 9 by 10 to get

$$\begin{aligned} p &= \frac{9}{10} \\ &= 0.90 \\ &= 90\%. \end{aligned}$$

Thus, Raven got 90% of the questions on the meteorology examination correct.

9. Let T represent the total mileage of the trip. Then we can translate the problem statement into words and symbols.

Miles already traveled	is	37%	of	total trip mileage
114	=	37%	·	T

Change the percent to a decimal by moving the decimal two places to the left.

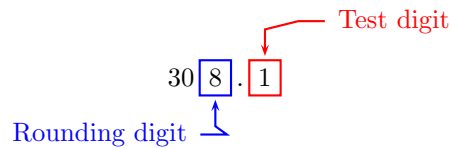
$$114 = 0.37 \cdot T$$

Divide both sides by 0.37. Carry the division to one decimal place.

$$\frac{114}{0.37} = \frac{0.37T}{0.37} \quad \text{Divide both sides by 0.37.}$$

$$308.1 \approx T \quad \text{Divide to 1 decimal place.}$$

Now round to the nearest mile.



Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, correct to the nearest mile,

$$T \approx 308$$

Thus, correct to the nearest mile, the total trip mileage is 308 miles.

11. Let S represent the total class size. Then we can translate the problem statement into words and symbols.

Students present	is	50%	of	total class size
65	=	50%	·	S

Change the percent to a decimal by moving the decimal two places to the left.

$$65 = 0.50 \cdot S$$

Divide both sides by 0.50. Carry the division to one decimal place.

$$\frac{65}{0.50} = \frac{0.50S}{0.50} \quad \text{Divide both sides by 0.50.}$$

$$130 = S \quad \text{Divide.}$$

Thus, the total class size is 130 students.

13. Let p represent the commission percentage. Then we can translate the problem statement into words and symbols.

Commission	is	what percent	of	sales price
43	=	p	·	591

The commutative property allows us to change the order of multiplication.

$$43 = 591p$$

Divide both sides by 591. Carry the division to four decimal places.

$$\frac{43}{591} = \frac{591p}{591} \quad \text{Divide both sides by 591.}$$

$$0.0727 \approx p \quad \text{Divide to 4 places.}$$

Change this a percent by moving the decimal point two places to the right.

$$p \approx 7.27\%$$

Now round to the nearest tenth of a percent.

$$7.\boxed{2}\boxed{7}\%$$

↑ Rounding digit ↘ Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, correct to the nearest tenth of a percent,

$$p \approx 7.3\%.$$

15. Let N represent the number of questions on the physics examination.

Number of correct answers	is	70%	of	total number of questions
98	=	70%	·	N

Because $70\% = 0.70$, this last equation can be written as

$$98 = 0.70N.$$

Solve for N .

$$\frac{98}{0.70} = \frac{0.70N}{0.70} \quad \text{Divide both sides by 0.70.}$$

$$140 = N \quad \text{Divide: } 98/0.70 = 140.$$

Hence, there were 140 questions on the physics examination.

17. Let P represent the sales price of the computer. We can now translate the words of the problem statement into mathematical symbols.

$$\begin{array}{ccccccc} \text{Sales tax} & \text{is} & 8\% & \text{of} & \text{sales price} & & \\ 20 & = & 8\% & \cdot & P & & \end{array}$$

Change the percent to a decimal by moving the decimal point two places to the left.

$$20 = 0.08P$$

Divide both sides by 0.08. Carry the division to one decimal place.

$$\begin{array}{l} \frac{20}{0.08} = \frac{0.08P}{0.08} \\ 250.0 \approx P \end{array} \quad \begin{array}{l} \text{Divide both sides by } 0.08. \\ \text{Divide to 1 place.} \end{array}$$

Now we round to the nearest dollar.

$$25 \boxed{0} . \boxed{0}$$

↑ Rounding digit ↘ Test digit

Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, correct to the nearest dollar,

$$P \approx \$250.$$

19. Let P represent the sales price of the computer. We can now translate the words of the problem statement into mathematical symbols.

$$\begin{array}{ccccccc} \text{Commission} & \text{is} & 6\% & \text{of} & \text{sales price} & & \\ 37 & = & 6\% & \cdot & P & & \end{array}$$

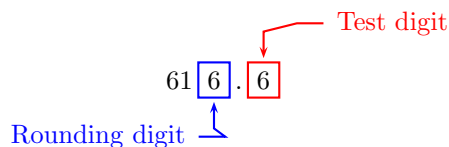
Change the percent to a decimal by moving the decimal point two places to the left.

$$37 = 0.06P$$

Divide both sides by 0.06. Carry the division to one decimal place.

$$\begin{array}{l} \frac{37}{0.06} = \frac{0.06P}{0.06} \\ 616.6 \approx P \end{array} \quad \begin{array}{l} \text{Divide both sides by } 0.06. \\ \text{Divide to 1 place.} \end{array}$$

Now we round to the nearest dollar.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, correct to the nearest dollar,

$$P \approx \$617.$$

21. Let T represent the total number of millilitres of solution. Then we can translate the problem statement into words and symbols.

Amount of nitric acid	is	23%	of	the total amount of solution
59	=	23%	·	T

Change the percent to a decimal by moving the decimal two places to the left.

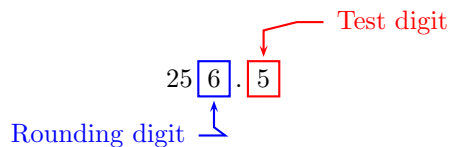
$$59 = 0.23 \cdot T$$

Divide both sides by 0.23. Carry the division to one decimal place.

$$\frac{59}{0.23} = \frac{0.23T}{0.23} \quad \text{Divide both sides by 0.23.}$$

$$256.5 \approx T \quad \text{Divide to 1 decimal place.}$$

Now round to the nearest millilitre.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, correct to the nearest millilitre,

$$T \approx 257.$$

Thus, correct to the nearest millilitre, the total solution measures 257 millilitres.

23. Let p represent the state sales tax rate. Then we can translate the problem statement into words and symbols.

$$\begin{array}{ccccccc} \text{Sales tax} & \text{is} & \text{what percent} & \text{of} & \text{sales price} \\ 45 & = & p & \cdot & 428 \end{array}$$

The commutative property allows us to change the order of multiplication.

$$45 = 428p$$

Divide both sides by 428. Carry the division to four decimal places.

$$\begin{array}{l} \frac{45}{428} = \frac{428p}{428} \qquad \text{Divide both sides by 428.} \\ 0.1051 \approx p \qquad \text{Divide to 4 places.} \end{array}$$

Change this a percent by moving the decimal point two places to the right.

$$p \approx 10.51\%$$

Now round to the nearest tenth of a percent.

$$10.\boxed{5}\boxed{1}\%$$

↑ Rounding digit ↘ Test digit

Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, correct to the nearest tenth of a percent,

$$p \approx 10.5\%.$$

25. Let w represent your weight on Mars.

$$\begin{array}{ccccccc} \text{Weight} & \text{is} & 38\% & \text{of} & \text{weight} \\ \text{on Mars} & & & & \text{on Earth} \\ w & = & 38\% & \cdot & 150 \end{array}$$

Because $38\% = 0.38$, this last equation can be written as

$$\begin{aligned} w &= 0.38 \cdot 150 \\ &= 57 \end{aligned}$$

Hence, you would weigh only 57 pounds on Mars.

27. Let s represent the number of seniors in Humboldt County.

$$\begin{array}{ccccccc} \text{Senior population} & & \text{is} & & \text{13\%} & & \text{of} & & \text{total population} \\ \text{in Humboldt} & & & & & & & & \text{in Humboldt} \\ s & & = & & 13\% & & \cdot & & 130,000 \end{array}$$

Because $13\% = 0.13$, this last equation can be written as

$$\begin{aligned} s &= 0.13 \cdot 130000 \\ &= 16900 \end{aligned}$$

There are about 16,900 people aged 65 and older in Humboldt County.

29. Let g represent the amount of antibiotics going to farm animals to make them grow faster, in the millions of pounds. Then we can translate the problem statement into words and symbols.

$$\begin{array}{ccccccc} \text{Amount of antibiotics} & & \text{is} & & \text{13\%} & & \text{of} & & \text{the total amount of} \\ \text{to make them grow faster} & & & & & & & & \text{antibiotics to farm animals} \\ g & & = & & 13\% & & \cdot & & 28 \end{array}$$

Writing the percent as a decimal and solving, we have

$$\begin{aligned} g &= 0.13 \cdot 28 && \text{Change percent to decimal.} \\ g &= 3.64 && \text{Multiply: } 0.13 \cdot 28 = 3.64. \end{aligned}$$

Thus, 3.64 million pounds of antibiotics were used on farm animals last year to make them grow faster.

31. Let w represent the total number of millions of gallons drinking water supplied daily to San Diego County.

$$\begin{array}{ccccccc} \text{Gallons of water supplied} & & \text{is} & & \text{10\%} & & \text{of} & & \text{the total gallons} \\ \text{by the new plant} & & & & & & & & \text{of water supplied} \\ 50 & & = & & 10\% & & \cdot & & w \end{array}$$

Since $10\% = 0.10$, this last equation can be written as

$$50 = 0.10w$$

Divide both sides by 0.10.

$$\begin{aligned} \frac{50}{0.10} &= \frac{0.10 \cdot w}{0.10} && \text{Divide both sides by 0.10.} \\ 500 &= w && \text{Divide.} \end{aligned}$$

The total gallons of drinking water supplied to San Diego County on a daily basis is 500 million gallons.

33. Let w represent the average water content for this time of year.

Current water content	is	92%	of	the average water content
25.9	=	92%	·	w

Since $92\% = 0.92$, this last equation can be written as

$$25.9 = 0.92w$$

Divide both sides by 0.92.

$\frac{25.9}{0.92} = \frac{0.92 \cdot w}{0.92}$	Divide both sides by 0.92.
$28.15 \approx w$	Divide.

Now round to the nearest tenth.

28.	1	5	Test digit
			Rounding digit

Because the test digit is equal to 5, add one to the rounding digit, then truncate. Thus, correct to a tenth of an inch,

$$w \approx 28.2$$

Thus, the average water content this time of year is 28.2 inches.

35. Let r represent the percent of stolen vehicles recovered. Then we can translate the problem statement into words and symbols.

Number of recovered vehicles	is	what percent	of	the number of stolen vehicles
427	=	r	·	499

Because multiplication is commutative, we can write the right-hand side of the last equation as follows.

$$427 = 499r$$

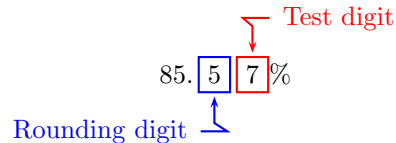
Divide both sides by 499. Carry the division to four decimal places.

$\frac{427}{499} = \frac{499p}{499}$	Divide both sides by 499.
$0.8557 \approx r$	Divide to 4 places.

To change this result to a percent, Move the decimal two places to the right and append a percent symbol.

$$r \approx 85.57\%$$

Now round to the nearest tenth of a percent.



Because the test digit is greater than 5, add one to the rounding digit, then truncate. Thus, correct to the nearest tenth of a percent,

$$r \approx 85.6\%.$$

In Humboldt County, California, approximately 85.6% of stolen vehicles are recovered.

37. Let w represent the percentage of waste Mr. Winkler uses of the average American's waste per person. Then we can translate the problem statement into words and symbols.

Pounds of waste Mr. Winkler produces	is	what percent	of	the pounds of waste an average American produces
40	=	w	·	1600

Because multiplication is commutative, we can write the right-hand side of the last equation as follows.

$$40 = 1600w$$

Divide both sides by 1600.

$$\frac{40}{1600} = \frac{1600w}{1600} \quad \text{Divide both sides by 1600.}$$

$$0.025 = w \quad \text{Divide to three decimal places.}$$

To change this result to a percent, move the decimal two places to the right and append a percent symbol.

$$w = 2.5\%$$

Thus, Mr. Winkler throws away only 2.5% of the average American's waste.

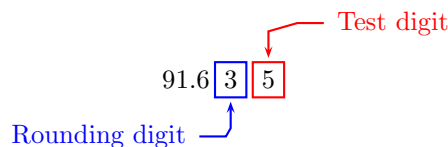
7.4 Percent Increase and Decrease

1. Let D represent the discount. We can translate words into symbols as follows.

$$\begin{array}{ccccccc} \text{Discount} & \text{is} & 20.5\% & \text{of} & \text{marked price} & & \\ D & = & 20.5\% & \cdot & 447 & & \end{array}$$

Change the percent into a decimal by moving the decimal point two places to the left. Solve the resulting equation for D .

$$\begin{array}{ll} D = 0.205 \cdot 447 & 20.5\% = 0.205. \\ D = 91.635 & \text{Multiply: } 0.205 \cdot 447 = 91.635. \end{array}$$



Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Therefore, to the nearest penny $D \approx \$91.64$. To find the new selling price, we must subtract this discount from the original price.

$$\begin{aligned} \text{Selling price} &= \text{Marked price} - \text{Discount} \\ &= 447 - 91.64 \\ &= 355.36 \end{aligned}$$

Thus, the sales price is \$355.36.

3. To find the decrease in population, first subtract the current population from the original population.

$$\begin{aligned} \text{Population decrease} &= \text{original population} - \text{current population} \\ &= 10794 - 8925 \\ &= 1869 \end{aligned}$$

Hence, the population has decreased by 1869 people.

Next, let p represent the percent population decrease. Then we can translate the problem into words and symbols.

$$\begin{array}{ccccccc} \text{Population decrease} & \text{is} & \text{what percent} & \text{of} & \text{original population} & & \\ 1869 & = & p & \cdot & 10794 & & \end{array}$$

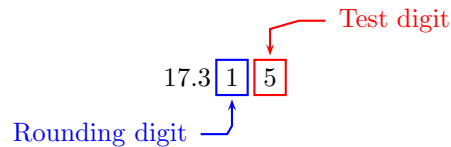
Use the distributive property to switch the order of multiplication, then solve for p .

$$\begin{aligned} 1869 &= 10794p && \text{Commutative property.} \\ \frac{1869}{10794} &= \frac{10794p}{10794} && \text{Divide both sides by 10794.} \\ 0.17315 &\approx p && \text{Carry division to 5 places.} \end{aligned}$$

To change p to a percent, move the decimal point two places to the right and append a percent symbol.

$$p \approx 17.315\%$$

To round to the nearest hundredth of a percent, identify the rounding digit and the test digit.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Therefore, to the nearest hundredth of a percent, $p \approx 17.32\%$.

5. If the car rack is offered at 3.5% discount, then it will be sold at the following percentage of its marked price.

$$\begin{aligned} \text{Percentage of marked price} &= 100\% - \text{Percent discount} \\ &= 100\% - 3.5\% \\ &= 96.5\% \end{aligned}$$

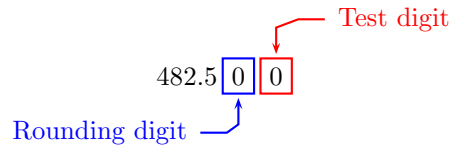
Let S represent the sales price after discount. We can now translate words into symbols as follows.

Sales price	is	96.5%	of	Marked price
S	=	96.5%	·	500

Change the percent to a decimal and solve for S .

$$\begin{aligned} S &= 0.965 \cdot 500 && \mathbf{96.5\% = 0.965.} \\ S &= 482.500 && \mathbf{Multiply: 0.965 \cdot 500 = 482.500.} \end{aligned}$$

To round to the nearest penny, identify the rounding digit and the test digit.



Because the test digit is less than 5, leave the rounding digit alone, then truncate. Therefore, to the nearest penny $S \approx \$482.50$.

7. If Silvertown's population decreases by 4.1%, then we can find the percent that remains by subtracting 4.1% from 100%.

$$\begin{aligned} \text{Percent remaining} &= 100\% - \text{Percent Decrease} \\ &= 100\% - 4.1\% \\ &= 95.9\% \end{aligned}$$

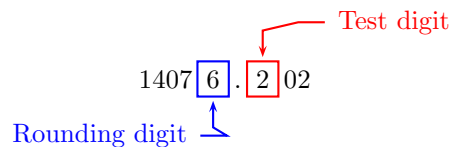
Let N represent the new population. We can then translate the words into symbols as follows.

New population	is	95.9%	of	original population
N	=	95.9%	·	14678

Change the percent to a decimal by moving the decimal point two places to the left, then solve the resulting equation for N .

$$\begin{aligned} N &= 0.959 \cdot 14678 & 95.9\% &= 0.959. \\ N &= 14076.202 & \text{Multiply: } &0.959 \cdot 14678 = 14076.202. \end{aligned}$$

Now we round to the nearest person. Identify the rounding and test digits.



Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, correct to the nearest person, the new population is 14,076.

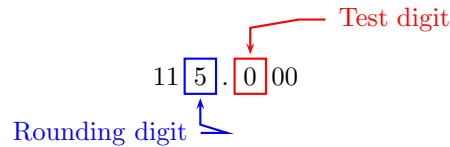
9. Let x represent the salesperson's salary increase. Then we can translate the problem into words and symbols.

Salary increase	is	4.6%	of	current salary
x	=	4.6%	·	2500

Change the percent to a decimal by moving the decimal point two places to the left, then solve for x .

$$\begin{aligned} x &= 0.046 \cdot 2500 & 4.6\% &= 0.046. \\ x &= 115.000 & \text{Multiply: } &0.046 \cdot 2500 = 115.000. \end{aligned}$$

To round to the nearest dollar, identify the rounding digit and the test digit.



Because the test digit is less than 5, leave the rounding digit alone, then truncate. Therefore, to the nearest dollar, the salary increase is \$115. To compute the new salary N , we must add this increase to the original salary.

New salary	is	current salary	plus	salary increase
N	=	2500	+	115

Thus, the new salary is $N = \$2,615$ per month.

11. We ask the following question.

Sales Price	is	What Percent	of	Marked Price
292	=	p	·	358

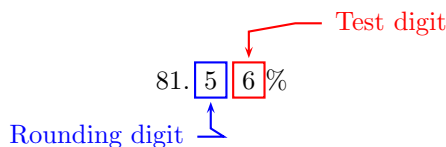
Use the commutative property to change the order of multiplication. Solve the resulting equation for p .

$$\begin{aligned} 292 &= 358p & \text{Commutative property.} \\ \frac{292}{358} &= \frac{358p}{358} & \text{Divide both sides by 358.} \\ 0.8156 &\approx p & \text{Divide: } 66/358 = 0.8156. \end{aligned}$$

We change this result to a percent by moving the decimal point two places to the right.

$$p \approx 81.56\%$$

To round to the nearest tenth of a percent, identify the rounding digit and the test digit.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Therefore, to the nearest tenth of a percent, $p \approx 81.6\%$. To find the percent discount, we need to subtract this percentage from 100%.

$$\begin{aligned}\text{Percent Discount} &= 100\% - 81.6\% \\ &= 18.4\%\end{aligned}$$

Hence, the percent discount is 18.4%.

13. We ask the following question.

New population	is	what percent	of	original population
12623	=	p	·	14393

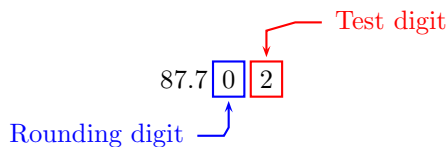
Use the distributive property to switch the order of multiplication, then solve for p .

$12623 = 14393p$	<i>Commutative property.</i>
$\frac{12623}{14393} = \frac{14393p}{14393}$	<i>Divide both sides by 14393.</i>
$0.87702 \approx p$	<i>Carry division to 5 places.</i>

To change p to a percent, move the decimal point two places to the right and append a percent symbol.

$$p \approx 87.702\%$$

To round to the nearest hundredth of a percent, identify the rounding digit and the test digit.



Because the test digit is less than 5, leave the rounding digit alone, then truncate. Therefore, to the nearest hundredth of a percent, $p \approx 87.70\%$. But this is the percent of the population that remains in Carlytown. To find the percent decrease, we must subtract this last result from 100%.

$$\begin{aligned}\text{Percent decrease} &= 100\% - \text{percent remaining} \\ &= 100\% - 87.70\% \\ &= 12.30\%\end{aligned}$$

15. Let x represent the population decrease. We can then translate the words into symbols as follows.

$$\begin{array}{ccccccc} \text{Population decrease} & \text{is} & 2.4\% & \text{of} & \text{original population} & & \\ x & = & 2.4\% & \cdot & 8780 & & \end{array}$$

Change the percent to a decimal by moving the decimal point two places to the left, then solve the resulting equation for x .

$$\begin{array}{ll} x = 0.024 \cdot 8780 & 2.4\% = 0.024. \\ x = 210.720 & \text{Multiply: } 0.024 \cdot 8780 = 210.720. \end{array}$$

Now we round to the nearest person. Identify the rounding and test digits.

$$21 \boxed{0} . \boxed{7} 20$$

Rounding digit Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, correct to the nearest person, the population decrease is

$$p \approx 211.$$

To find the new population, subtract the decrease from the original population.

$$\begin{aligned} \text{New population} &= \text{Original population} - \text{Population Decrease} \\ &= 8780 - 211 \\ &= 8569 \end{aligned}$$

Thus, the new population is 8,569.

17. We ask the following question.

$$\begin{array}{ccccccc} \text{New salary} & \text{is} & \text{what percent} & \text{of} & \text{original salary} & & \\ 2950 & = & p & \cdot & 2600 & & \end{array}$$

Use the commutative property to change the order, then solve the equation for p .

$$\begin{array}{ll} 2950 = 2600p & \text{Commutative property.} \\ \frac{2950}{2600} = \frac{2600p}{2600} & \text{Divide both sides by 2600.} \\ 1.1346 \approx p & \text{Divide to 4 places.} \end{array}$$

Change the result to a percent by moving the decimal two places to the right.

$$p \approx 113.46\%$$

Identify the rounding digit and the test digit.

$$113.\boxed{4}\boxed{6}\%$$

↑ Rounding digit ↘ Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, correct to the nearest tenth of a percent,

$$p \approx 113.5\%.$$

To find the percent increase, we need to find how much more than 100% of our salary is returned. Subtract 100% from the last result.

$$\begin{aligned} \text{Percent increase} &= 113.5\% - 100\% \\ &= 13.5\% \end{aligned}$$

Hence, the percent increase is 13.5%.

19. To find the increase in salary, first subtract the original salary from the new salary.

$$\begin{aligned} \text{Salary increase} &= \text{new salary} - \text{original salary} \\ &= 4300 - 4200 \\ &= 100 \end{aligned}$$

Hence, the bartender sees an increase in salary of \$100. Now we can translate words into symbols. Let p represent the percent increase.

Salary Increase	is	what percent	of	original salary
100	=	p	·	4200

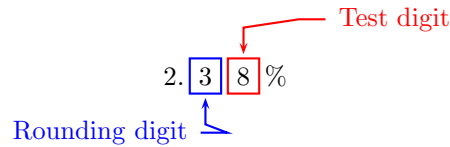
Use the commutative property to change the order, then solve the equation for p .

$$\begin{aligned} 100 &= 4200p && \text{Commutative property.} \\ \frac{100}{4200} &= \frac{4200p}{4200} && \text{Divide both sides by 4200.} \\ 0.0238 &\approx p && \text{Divide to 4 places.} \end{aligned}$$

Change the result to a percent by moving the decimal two places to the right.

$$p \approx 2.38\%$$

Identify the rounding digit and the test digit.



Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, correct to the nearest tenth of a percent,

$$p \approx 2.4\%.$$

21. Let N represent the salesperson's new salary. If the salesperson's salary is increased by 5.1%, then his new salary will be 105.1% of his original salary. We can now translate the problem into words and symbols.

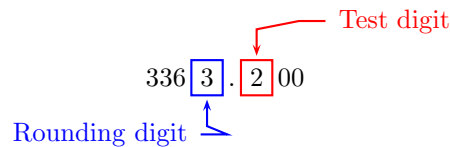
New salary	is	105.1%	of	original salary
N	=	1.051%	·	3200

Change the percent to a decimal by moving the decimal point two places to the left, then solve for N .

$$N = 1.051 \cdot 3200 \qquad 105.1\% = 1.051.$$

$$N = 3363.200 \qquad \text{Multiply: } 1.051 \cdot 3200 = 3363.200.$$

To round to the nearest dollar, identify the rounding digit and the test digit.



Because the test digit is less than 5, leave the rounding digit alone, then truncate. Therefore, to the nearest dollar, the new salary is $N \approx \$3,363$ per month.

23. We compute the discount D with the following calculation.

$$\begin{aligned} \text{Discount} &= \text{Marked Price} - \text{Sales Price} \\ &= 437 - 347 \\ &= 90. \end{aligned}$$

Hence, the discount is $D = \$90$. We can find the percent discount with the following argument. Let p represent the percent discount.

Discount	is	Percent Discount	of	Marked Price
90	=	p	·	437

Use the commutative property to change the order of multiplication. Solve the resulting equation for p .

$$\begin{aligned}
 90 &= 437p && \text{Commutative property.} \\
 \frac{90}{437} &= \frac{437p}{437} && \text{Divide both sides by 437.} \\
 0.2059 &\approx p && \text{Divide: } 90/437 = 0.2059.
 \end{aligned}$$

We change this result to a percent by moving the decimal point two places to the right.

$$p \approx 20.59\%$$

To round to the nearest tenth of a percent, identify the rounding digit and the test digit.

$$20.\boxed{5}\boxed{9}\%$$

↑ Rounding digit ↖ Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Therefore, to the nearest tenth of a percent, $p \approx 20.6\%$.

25.

- a) To find the increase in price, subtract the original price from the new price.

$$\begin{aligned}
 \text{Price increase} &= \text{New price} - \text{Original price} \\
 &= 0.28 - 0.20 \\
 &= 0.08
 \end{aligned}$$

The increase in price is \$0.08, or 8 cents.

- b) Let p represent the percent increase. Then,

Price increase	is	what percent	of	original price
0.08	=	p	·	0.20

Solve the equation for p .

$$\begin{aligned} 0.08 &= 0.20p && \text{Change order of multiplication.} \\ \frac{0.08}{0.20} &= \frac{0.20p}{0.20} && \text{Divide both sides by 0.20.} \\ 0.40 &= p && \text{Divide: } 0.08/0.20 = 0.40. \end{aligned}$$

Finally, change $p = 0.40$ to a percent by moving the decimal two places to the right; i.e., $p = 40\%$.

27. First calculate the increase in price.

$$\begin{aligned} \text{Increase} &= \text{later price} - \text{original price} \\ &= 3.28 - 2.57 \\ &= 0.71 \end{aligned}$$

Hence, the increase in price is \$0.71.

Let p represent the percent increase.

Price increase	is	what percent	of	original price
0.71	=	p	·	2.57

Solve the equation for p .

$$\begin{aligned} 0.71 &= 2.57p && \text{Change order of multiplication.} \\ \frac{0.71}{2.57} &= \frac{2.57p}{2.57} && \text{Divide both sides by 2.57.} \\ 0.276 &\approx p && \text{Divide: } 0.71/2.57 \approx 0.276. \end{aligned}$$

Change $p \approx 0.276$ to a percent by moving the decimal two places to the right; i.e., $p = 27.6\%$. Now we will round to the nearest percent.

$$p \approx 2 \boxed{7} . \boxed{6} \%$$

↑ Test digit
↑ Rounding digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit and truncate. Hence, to the nearest percent, the percent increase is approximately 28%.

29. Let x represent the amount of the insurance increase. Then we can translate the problem into words and symbols.

Insurance increase	is	39%	of	current insurance cost
x	=	39%	·	858

Change the percent to a decimal by moving the decimal point two places to the left, then solve for x .

$$x = 0.39 \cdot 858 \qquad 39\% = 0.39.$$

$$x = 334.62 \qquad \text{Multiply: } 0.39 \cdot 858 = 334.62.$$

To round to the nearest dollar, identify the rounding digit and the test digit.

$$33 \boxed{4} . \boxed{6} 2$$

↑ Rounding digit ↘ Test digit

Because the test digit is greater than 5, add one to the rounding digit, then truncate. Therefore, to the nearest dollar, the salary increase is \$335. To compute the new insurance cost C , we must add this increase to the original insurance cost.

New cost	is	current cost	plus	insurance increase
C	=	858	+	335

Thus, the new monthly cost will be $C = \$1,193$ per month.

31. We ask the following question.

New number dairy cows	is	what percent	of	original number dairy cows
530,000	=	p	·	180,000

Use the commutative property to change the order, then solve the equation for p .

$$530,000 = 180,000p \qquad \text{Commutative property.}$$

$$\frac{530,000}{180,000} = \frac{180,000p}{180,000} \qquad \text{Divide both sides by 180,000.}$$

$$2.944 \approx p \qquad \text{Divide to 3 places.}$$

Change the result to a percent by moving the decimal two places to the right.

$$p \approx 294.4\%$$

Identify the rounding digit and the test digit.

$$29 \boxed{4} . \boxed{4}$$

Rounding digit Test digit

Because the test digit is less than 5, leave the rounding digit alone and truncate. Thus, correct to the nearest percent,

$$p \approx 294\%.$$

To find the percent increase, we need to find how much more than 100% of dairy cows Idaho has currently. Subtract 100% from the last result.

$$\begin{aligned} \text{Percent increase} &= 294\% - 100\% \\ &= 194\% \end{aligned}$$

Hence, the number of industrial dairy cows has increased 194% over previous numbers.

33.

a) We ask the following question.

New send time	is	what percent	of	current send time
88	=	p	·	140

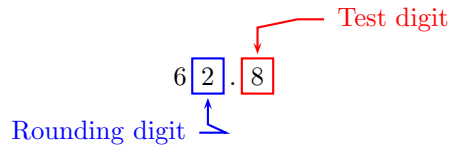
Use the distributive property to switch the order of multiplication, then solve for p .

$$\begin{aligned} 88 &= 140p && \text{Commutative property.} \\ \frac{88}{140} &= \frac{140p}{140} && \text{Divide both sides by 140.} \\ 0.628 &\approx p && \text{Carry division to 3 places.} \end{aligned}$$

To change p to a percent, move the decimal point two places to the right and append a percent symbol.

$$p \approx 62.8\%$$

To round to the nearest percent, identify the rounding digit and the test digit.



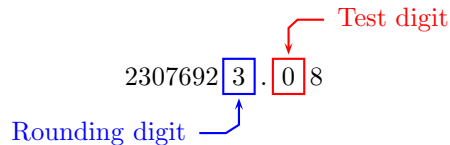
Because the test digit is greater than or equal to 5, add one to the rounding digit and truncate. Therefore, to the nearest percent, $p \approx 63\%$. But this is the percent of the new time that the old time was. To find the percent decrease, we must subtract this last result from 100%.

$$\begin{aligned}\text{Percent decrease} &= 100\% - 63\% \\ &= 37\%\end{aligned}$$

- b) The new send time is $140 - 88 = 52$ milliseconds. To find the cost per millisecond of time savings, divide the total cost \$1,200,000,000 by 52.

$$\begin{aligned}c &= \frac{1,200,000,000}{52} \\ &= 23,076,923.08\end{aligned}$$

To round to the nearest dollar, identify the rounding digit and the test digit.



Because the test digit is less than 5, leave the rounding digit alone and truncate. Therefore, the cost per millisecond of time savings is approximately \$23,076,923.

- 35.** First calculate the increase in hours of daylight from winter to summer.

$$\begin{aligned}\text{Increase} &= \text{hours of daylight in summer} - \text{hours of daylight in winter} \\ &= 14 - 10 \\ &= 4\end{aligned}$$

Thus, there are 4 hours more of daylight in summer than in winter.

Let h represent the percent increase in hours of daylight.

Increase in daylight hours in summer	is	what percent	of	hours of daylight in winter
4	=	h	·	10

Solve the equation for h .

$$4 = 10h \quad \text{Change order of multiplication.}$$

$$\frac{4}{10} = \frac{10h}{10} \quad \text{Divide both sides by 10.}$$

$$0.4 = h \quad \text{Divide: } 4/10 = 0.4.$$

Change $h = 0.4$ to a percent by moving the decimal two places to the right; i.e., $h = 40\%$. Therefore, there are 40% more hours of daylight in summer than in winter.

37.

a) We ask the following question.

Home price in 2009	is	what percent	of	home price in 2000
285,000	=	p	·	152,257

Use the distributive property to switch the order of multiplication, then solve for p .

$$285,000 = 152,257p \quad \text{Commutative property.}$$

$$\frac{285,000}{152,257} = \frac{152,257p}{152,257} \quad \text{Divide both sides by 152,257.}$$

$$1.871 \approx p \quad \text{Carry division to 3 places.}$$

To change p to a percent, move the decimal point two places to the right and append a percent symbol.

$$p \approx 187.1\%$$

To round to the nearest percent, identify the rounding digit and the test digit.

$$18 \boxed{7} . \boxed{1}$$

↑ Rounding digit ↓ Test digit

Because the test digit is less than 5, leave the rounding digit alone and truncate. Therefore, to the nearest percent, $p \approx 187\%$. But this is the

percent of average home price in 2009. How much more than 100% is this price?

$$\begin{aligned}\text{Percent increase} &= 187\% - 100\% \\ &= 87\%\end{aligned}$$

Thus, there has been a 87% increase in average home price from the year 2000 to 2009.

b) We ask the following question.

Number of homes sold in 2009	is	what percent	of	number of homes sold in 2000
833	=	p	·	1358

Use the distributive property to switch the order of multiplication, then solve for p .

$$\begin{aligned}833 &= 1358p && \text{Commutative property.} \\ \frac{833}{1358} &= \frac{1358p}{1358} && \text{Divide both sides by 1358.} \\ 0.613 &\approx p && \text{Carry division to 3 places.}\end{aligned}$$

To change p to a percent, move the decimal point two places to the right and append a percent symbol.

$$p \approx 61.3\%$$

To round to the nearest percent, identify the rounding digit and the test digit.

$$6 \boxed{1} . \boxed{3}$$

↑ Rounding digit ↘ Test digit

Because the test digit is less than 5, leave the rounding digit alone and truncate. Therefore, to the nearest percent, $p \approx 61\%$. But this is the percent of homes sold in 2009. To find the percent change, subtract this from 100%.

$$\begin{aligned}\text{Percent decrease} &= 100\% - 61\% \\ &= 39\%\end{aligned}$$

Thus, there has been a 39% decrease in the number of homes sold from the year 2000 to 2009.

7.5 Interest

1. The formula for simple interest is $I = Prt$. The principal is $P = 7600$ and the interest rate is $r = 8\% = 0.08$. The duration of the investment is $t = 7$ years. Substitute these values into the simple interest formula:

$$\begin{aligned} I &= (7600)(0.08)(7) && \text{Substitute.} \\ &= 4256 && \text{Multiply.} \end{aligned}$$

Hence, the interest earned in 7 years is \$4,256.

3. The formula for simple interest is $I = Prt$. The principal is $P = 5800$ and the interest rate is $r = 3.25\% = 0.0325$. The duration of the investment is $t = 4$ years. Substitute these values into the simple interest formula:

$$\begin{aligned} I &= (5800)(0.0325)(4) && \text{Substitute.} \\ &= 754 && \text{Multiply.} \end{aligned}$$

Hence, the interest earned in 4 years is \$754.

5. The formula for simple interest is $I = Prt$. The principal is $P = 2400$ and the interest rate is $r = 8.25\% = 0.0825$. The duration of the investment is $t = 5$ years. Substitute these values into the simple interest formula:

$$\begin{aligned} I &= (2400)(0.0825)(5) && \text{Substitute.} \\ &= 990 && \text{Multiply.} \end{aligned}$$

Hence, the interest earned in 5 years is \$990.

7. The formula for simple interest is $I = Prt$. The principal is $P = 4000$ and the interest rate is $r = 7.25\% = 0.0725$. The duration of the investment is $t = 6$ years. Substitute these values into the simple interest formula:

$$\begin{aligned} I &= (4000)(0.0725)(6) && \text{Substitute.} \\ &= 1740 && \text{Multiply.} \end{aligned}$$

Hence, the interest earned in 6 years is \$1,740.

9. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 2 months must be converted to years:

$$2 \text{ months} = 2 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{2 \text{ months}} \cdot \frac{1 \text{ yr}}{\cancel{12 \text{ months}}} = \frac{2}{12} \text{ yr} = \frac{1}{6} \text{ yr}$$

The principal is $P = 3600$ and the interest rate is $r = 4.5\% = 0.045$. The duration of the investment is $1/6$ year. Substitute these values into the simple interest formula:

$$\begin{aligned} I &= (3600)(0.045) \left(\frac{1}{6}\right) && \text{Substitute.} \\ &= \frac{162}{6} && \text{Multiply numerators.} \\ &= 27 && \text{Divide.} \end{aligned}$$

Hence, the interest owed is \$27.

11. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 6 months must be converted to years:

$$6 \text{ months} = 6 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{6 \text{ months}} \cdot \frac{1 \text{ yr}}{\cancel{12 \text{ months}}} = \frac{6}{12} \text{ yr} = \frac{1}{2} \text{ yr}$$

The principal is $P = 2400$ and the interest rate is $r = 2\% = 0.02$. The duration of the investment is $1/2$ year. Substitute these values into the simple interest formula:

$$\begin{aligned} I &= (2400)(0.02) \left(\frac{1}{2}\right) && \text{Substitute.} \\ &= \frac{48}{2} && \text{Multiply numerators.} \\ &= 24 && \text{Divide.} \end{aligned}$$

Hence, the interest owed is \$24.

13. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 6 months must be converted to years:

$$6 \text{ months} = 6 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{6 \text{ months}} \cdot \frac{1 \text{ yr}}{\cancel{12 \text{ months}}} = \frac{6}{12} \text{ yr} = \frac{1}{2} \text{ yr}$$

The interest owed is $I = 68$ and the interest rate is $r = 8\% = 0.08$. The duration of the investment is $1/2$ year. Substitute these values into the simple interest formula:

$$\begin{aligned} 68 &= P(0.08) \left(\frac{1}{2}\right) && \text{Substitute.} \\ 68 &= \frac{0.08}{2}P && \text{Multiply numerators and rearrange the right side.} \\ 68 \cdot 2 &= 0.08P && \text{Multiply both sides by 2.} \\ 136 &= 0.08P && \text{Simplify.} \\ \frac{136}{0.08} &= P && \text{Divide both sides by 0.08.} \\ 1700 &= P && \text{Simplify.} \end{aligned}$$

Hence, the principal was \$1,700.

15. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 3 months must be converted to years:

$$3 \text{ months} = 3 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{3 \text{ months}} \cdot \frac{1 \text{ yr}}{12 \cancel{\text{ months}}} = \frac{3}{12} \text{ yr} = \frac{1}{4} \text{ yr}$$

The principal is $P = 3600$ and the interest rate is $r = 8\% = 0.08$. The duration of the investment is $1/4$ year. Substitute these values into the simple interest formula:

$$\begin{aligned} I &= (3600)(0.08) \left(\frac{1}{4} \right) && \text{Substitute.} \\ &= \frac{288}{4} && \text{Multiply numerators.} \\ &= 72 && \text{Divide.} \end{aligned}$$

Hence, the interest owed is \$72.

17. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 2 months must be converted to years:

$$2 \text{ months} = 2 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{2 \text{ months}} \cdot \frac{1 \text{ yr}}{12 \cancel{\text{ months}}} = \frac{2}{12} \text{ yr} = \frac{1}{6} \text{ yr}$$

The interest owed is $I = 85$ and the interest rate is $r = 8.5\% = 0.085$. The duration of the investment is $1/6$ year. Substitute these values into the simple interest formula:

$$\begin{aligned} 85 &= P(0.085) \left(\frac{1}{6} \right) && \text{Substitute.} \\ 85 &= \frac{0.085}{6} P && \text{Multiply numerators and rearrange the right side.} \\ 85 \cdot 6 &= 0.085P && \text{Multiply both sides by 6.} \\ 510 &= 0.085P && \text{Simplify.} \\ \frac{510}{0.085} &= P && \text{Divide both sides by 0.085.} \\ 6000 &= P && \text{Simplify.} \end{aligned}$$

Hence, the principal was \$6,000.

19. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 3 months must be converted to years:

$$3 \text{ months} = 3 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{3 \text{ months}} \cdot \frac{1 \text{ yr}}{\cancel{12 \text{ months}}} = \frac{3}{12} \text{ yr} = \frac{1}{4} \text{ yr}$$

The principal is $P = 4000$ and the interest owed is $I = 35$. The duration of the investment is $1/4$ year. Substitute these values into the simple interest formula:

$$35 = (4000)(r) \left(\frac{1}{4} \right) \quad \text{Substitute.}$$

$$35 = \frac{4000}{4} r \quad \text{Multiply numerators and rearrange the right side.}$$

$$35 \cdot 4 = 4000r \quad \text{Multiply both sides by 4.}$$

$$140 = 4000r \quad \text{Simplify.}$$

$$\frac{140}{4000} = r \quad \text{Divide both sides by 4000.}$$

$$0.035 = r \quad \text{Simplify.}$$

Hence, the interest rate was 3.5%.

21. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 6 months must be converted to years:

$$6 \text{ months} = 6 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{6 \text{ months}} \cdot \frac{1 \text{ yr}}{\cancel{12 \text{ months}}} = \frac{6}{12} \text{ yr} = \frac{1}{2} \text{ yr}$$

The interest owed is $I = 287$ and the interest rate is $r = 7\% = 0.07$. The duration of the investment is $1/2$ year. Substitute these values into the simple interest formula:

$$287 = P(0.07) \left(\frac{1}{2} \right) \quad \text{Substitute.}$$

$$287 = \frac{0.07}{2} P \quad \text{Multiply numerators and rearrange the right side.}$$

$$287 \cdot 2 = 0.07P \quad \text{Multiply both sides by 2.}$$

$$574 = 0.07P \quad \text{Simplify.}$$

$$\frac{574}{0.07} = P \quad \text{Divide both sides by 0.07.}$$

$$8200 = P \quad \text{Simplify.}$$

Hence, the principal was \$8,200.

23. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 2 months must be converted to years:

$$2 \text{ months} = 2 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{2 \text{ months}} \cdot \frac{1 \text{ yr}}{\cancel{12 \text{ months}}} = \frac{2}{12} \text{ yr} = \frac{1}{6} \text{ yr}$$

The principal is $P = 7300$ and the interest owed is $I = 73$. The duration of the investment is $1/6$ year. Substitute these values into the simple interest formula:

$$\begin{aligned} 73 &= (7300)(r) \left(\frac{1}{6} \right) && \text{Substitute.} \\ 73 &= \frac{7300}{6} r && \text{Multiply numerators and rearrange the right side.} \\ 73 \cdot 6 &= 7300r && \text{Multiply both sides by 6.} \\ 438 &= 7300r && \text{Simplify.} \\ \frac{438}{7300} &= r && \text{Divide both sides by 7300.} \\ 0.06 &= r && \text{Simplify.} \end{aligned}$$

Hence, the interest rate was 6%.

25. The formula for simple interest is $I = Prt$. Because the interest rate is per year, the given time period of 6 months must be converted to years:

$$6 \text{ months} = 6 \text{ months} \cdot \frac{1 \text{ yr}}{12 \text{ months}} = \cancel{6 \text{ months}} \cdot \frac{1 \text{ yr}}{\cancel{12 \text{ months}}} = \frac{6}{12} \text{ yr} = \frac{1}{2} \text{ yr}$$

The principal is $P = 3200$ and the interest owed is $I = 96$. The duration of the investment is $1/2$ year. Substitute these values into the simple interest formula:

$$\begin{aligned} 96 &= (3200)(r) \left(\frac{1}{2} \right) && \text{Substitute.} \\ 96 &= \frac{3200}{2} r && \text{Multiply numerators and rearrange the right side.} \\ 96 \cdot 2 &= 3200r && \text{Multiply both sides by 2.} \\ 192 &= 3200r && \text{Simplify.} \\ \frac{192}{3200} &= r && \text{Divide both sides by 3200.} \\ 0.06 &= r && \text{Simplify.} \end{aligned}$$

Hence, the interest rate was 6%.

27. The balance is given by the formula $A = P(1 + rt)$. The principal is $P = 6700$ and the interest rate is $r = 9\% = 0.09$. The duration of the investment is $t = 4$ years. Substitute these values into the balance formula:

$$\begin{aligned} A &= (6700)(1 + 0.09 \cdot 4) && \text{Substitute.} \\ &= (6700)(1 + 0.36) && \text{Multiply.} \\ &= (6700)(1.36) && \text{Add.} \\ &= 9112 && \text{Multiply.} \end{aligned}$$

Hence, the balance after 4 years will be \$9,112.

29. The balance is given by the formula $A = P(1 + rt)$. The principal is $P = 1600$ and the interest rate is $r = 2\% = 0.02$. The duration of the investment is $t = 3$ years. Substitute these values into the balance formula:

$$\begin{aligned} A &= (1600)(1 + 0.02 \cdot 3) && \text{Substitute.} \\ &= (1600)(1 + 0.06) && \text{Multiply.} \\ &= (1600)(1.06) && \text{Add.} \\ &= 1696 && \text{Multiply.} \end{aligned}$$

Hence, the balance after 3 years will be \$1,696.

31. The balance is given by the formula $A = P(1 + rt)$. The principal is $P = 8900$ and the interest rate is $r = 2.5\% = 0.025$. The duration of the investment is $t = 2$ years. Substitute these values into the balance formula:

$$\begin{aligned} A &= (8900)(1 + 0.025 \cdot 2) && \text{Substitute.} \\ &= (8900)(1 + 0.05) && \text{Multiply.} \\ &= (8900)(1.05) && \text{Add.} \\ &= 9345 && \text{Multiply.} \end{aligned}$$

Hence, the balance after 2 years will be \$9,345.

33. The balance is given by the formula $A = P(1 + rt)$. The principal is $P = 5400$ and the interest rate is $r = 4.25\% = 0.0425$. The duration of the investment is $t = 2$ years. Substitute these values into the balance formula:

$$\begin{aligned} A &= (5400)(1 + 0.0425 \cdot 2) && \text{Substitute.} \\ &= (5400)(1 + 0.085) && \text{Multiply.} \\ &= (5400)(1.085) && \text{Add.} \\ &= 5859 && \text{Multiply.} \end{aligned}$$

Hence, the balance after 2 years will be \$5,859.

35. The balance is given by the formula $A = P(1 + rt)$. The balance is $A = 10222$ and the principal is $P = 7600$. The duration of the investment is $t = 6$ years. Substitute these values into the balance formula and solve the resulting equation:

$$\begin{array}{ll} 10222 = 7600(1 + r(6)) & \text{Substitute.} \\ 10222 = 7600 + 45600r & \text{Distribute.} \\ 2622 = 45600r & \text{Subtract 7600 from both sides.} \\ \frac{2622}{45600} = r & \text{Divide both sides by 45600.} \\ 0.0575 = r & \text{Simplify.} \end{array}$$

Hence, the interest rate was 5.75%.

37. The balance is given by the formula $A = P(1 + rt)$. The balance is $A = 4640$ and the interest rate is $r = 9\% = 0.09$. The duration of the investment is $t = 5$ years. Substitute these values into the balance formula and solve the resulting equation:

$$\begin{array}{ll} 4640 = P(1 + 0.09 \cdot 5) & \text{Substitute.} \\ 4640 = P(1 + 0.45) & \text{Multiply.} \\ 4640 = P(1.45) & \text{Add.} \\ \frac{4640}{1.45} = P & \text{Divide both sides by 1.45.} \\ 3200 = P & \text{Simplify.} \end{array}$$

Hence, the amount borrowed was \$3,200.

39. The balance is given by the formula $A = P(1 + rt)$. The balance is $A = 9593$ and the interest rate is $r = 9\% = 0.09$. The duration of the investment is $t = 9$ years. Substitute these values into the balance formula and solve the resulting equation:

$$\begin{array}{ll} 9593 = P(1 + 0.09 \cdot 9) & \text{Substitute.} \\ 9593 = P(1 + 0.81) & \text{Multiply.} \\ 9593 = P(1.81) & \text{Add.} \\ \frac{9593}{1.81} = P & \text{Divide both sides by 1.81.} \\ 5300 = P & \text{Simplify.} \end{array}$$

Hence, the amount borrowed was \$5,300.

41. The balance is given by the formula $A = P(1 + rt)$. The balance is $A = 5941$ and the principal is $P = 5200$. The duration of the investment is $t = 3$ years. Substitute these values into the balance formula and solve the resulting equation:

$$\begin{aligned} 5941 &= 5200(1 + r(3)) && \text{Substitute.} \\ 5941 &= 5200 + 15600r && \text{Distribute.} \\ 741 &= 15600r && \text{Subtract 5200 from both sides.} \\ \frac{741}{15600} &= r && \text{Divide both sides by 15600.} \\ 0.0475 &= r && \text{Simplify.} \end{aligned}$$

Hence, the interest rate was 4.75%.

43. The balance is given by the formula $A = P(1 + rt)$. The balance is $A = 5400$ and the principal is $P = 4000$. The duration of the investment is $t = 5$ years. Substitute these values into the balance formula and solve the resulting equation:

$$\begin{aligned} 5400 &= 4000(1 + r(5)) && \text{Substitute.} \\ 5400 &= 4000 + 20000r && \text{Distribute.} \\ 1400 &= 20000r && \text{Subtract 4000 from both sides.} \\ \frac{1400}{20000} &= r && \text{Divide both sides by 20000.} \\ 0.07 &= r && \text{Simplify.} \end{aligned}$$

Hence, the interest rate was 7%.

45. The balance is given by the formula $A = P(1 + rt)$. The balance is $A = 11550$ and the interest rate is $r = 7.5\% = 0.075$. The duration of the investment is $t = 5$ years. Substitute these values into the balance formula and solve the resulting equation:

$$\begin{aligned} 11550 &= P(1 + 0.075 \cdot 5) && \text{Substitute.} \\ 11550 &= P(1 + 0.375) && \text{Multiply.} \\ 11550 &= P(1.375) && \text{Add.} \\ \frac{11550}{1.375} &= P && \text{Divide both sides by 1.375.} \\ 8400 &= P && \text{Simplify.} \end{aligned}$$

Hence, the amount borrowed was \$8,400.

47. The balance is given by the formula $A = P(1 + rt)$. The balance is $A = 5720$ and the principal is $P = 4400$. The duration of the investment is $t = 4$ years. Substitute these values into the balance formula and solve the resulting equation:

$$\begin{array}{ll} 5720 = 4400(1 + r(4)) & \text{Substitute.} \\ 5720 = 4400 + 17600r & \text{Distribute.} \\ 1320 = 17600r & \text{Subtract 4400 from both sides.} \\ \frac{1320}{17600} = r & \text{Divide both sides by 17600.} \\ 0.075 = r & \text{Simplify.} \end{array}$$

Hence, the interest rate was 7.5%.

49. The balance is given by the formula $A = P(1 + rt)$. The balance is $A = 9768$ and the interest rate is $r = 4\% = 0.04$. The duration of the investment is $t = 8$ years. Substitute these values into the balance formula and solve the resulting equation:

$$\begin{array}{ll} 9768 = P(1 + 0.04 \cdot 8) & \text{Substitute.} \\ 9768 = P(1 + 0.32) & \text{Multiply.} \\ 9768 = P(1.32) & \text{Add.} \\ \frac{9768}{1.32} = P & \text{Divide both sides by 1.32.} \\ 7400 = P & \text{Simplify.} \end{array}$$

Hence, the amount borrowed was \$7,400.

7.6 Pie Charts

1. Raven received 21% of the total votes. We must take 21% of 360° to determine the central angle of the sector representing Raven's portion of the votes.

$$\begin{aligned} 21\% \cdot 360^\circ &= 0.21 \cdot 360^\circ \\ &= 75.60^\circ \end{aligned}$$

To round to the nearest degree, locate the rounding digit and the test digit.

$$7 \boxed{5} . \boxed{6} 0^\circ$$

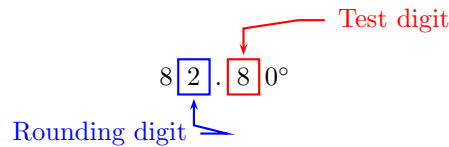
↑ Rounding digit ↘ Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, to the nearest degree, the central angle of the sector representing Raven's portion of the vote is 76° .

3. Akbar received 23% of the total votes. We must take 23% of 360° to determine the central angle of the sector representing Akbar's portion of the votes.

$$\begin{aligned} 23\% \cdot 360^\circ &= 0.23 \cdot 360^\circ \\ &= 82.80^\circ \end{aligned}$$

To round to the nearest degree, locate the rounding digit and the test digit.

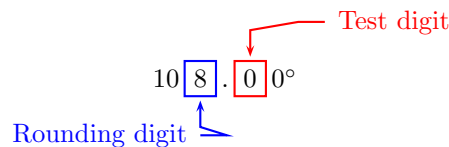


Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, to the nearest degree, the central angle of the sector representing Akbar's portion of the vote is 83° .

5. Jamal received 30% of the total votes. We must take 30% of 360° to determine the central angle of the sector representing Jamal's portion of the votes.

$$\begin{aligned} 30\% \cdot 360^\circ &= 0.3 \cdot 360^\circ \\ &= 108.00^\circ \end{aligned}$$

To round to the nearest degree, locate the rounding digit and the test digit.



Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, to the nearest degree, the central angle of the sector representing Jamal's portion of the vote is 108° .

7. Chin received 5 out of 50 votes cast.

Chin's votes	are	what percent	of	total votes cast
5	=	p	·	50

Use the commutative property to change the order, then solve for p .

$$5 = 50p \quad \text{Commutative property.}$$

$$\frac{5}{50} = \frac{50p}{50} \quad \text{Divide both sides by 50.}$$

$$0.10 = p \quad \text{Divide: } 5/50 = 0.10.$$

Moving the decimal two places to the right, Chin captured 10% of the total vote. We must take 10% of 360° to determine the central angle of the sector representing Chin's portion of the votes.

$$10\% \cdot 360^\circ = 0.10 \cdot 360^\circ$$

$$= 36.00^\circ$$

To round to the nearest degree, locate the rounding digit and the test digit.

$$3 \boxed{6} . \boxed{0} 0^\circ$$

↑ Rounding digit ↘ Test digit

Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, to the nearest degree, the central angle of the sector representing Chin's portion of the vote is 36° .

9. Kamili received 14 out of 50 votes cast.

Kamili's votes	are	what percent	of	total votes cast
14	=	p	·	50

Use the commutative property to change the order, then solve for p .

$$14 = 50p \quad \text{Commutative property.}$$

$$\frac{14}{50} = \frac{50p}{50} \quad \text{Divide both sides by 50.}$$

$$0.28 = p \quad \text{Divide: } 14/50 = 0.28.$$

Moving the decimal two places to the right, Kamili captured 28% of the total vote. We must take 28% of 360° to determine the central angle of the sector representing Kamili's portion of the votes.

$$\begin{aligned} 28\% \cdot 360^\circ &= 0.28 \cdot 360^\circ \\ &= 100.80^\circ \end{aligned}$$

To round to the nearest degree, locate the rounding digit and the test digit.

$$10 \boxed{0} . \boxed{8} 0^\circ$$

↑ Rounding digit ↓ Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, to the nearest degree, the central angle of the sector representing Kamili's portion of the vote is 101° .

11. Hue received 13 out of 50 votes cast.

Hue's votes	are	what percent	of	total votes cast
13	=	p	·	50

Use the commutative property to change the order, then solve for p .

$$\begin{aligned} 13 &= 50p && \text{Commutative property.} \\ \frac{13}{50} &= \frac{50p}{50} && \text{Divide both sides by 50.} \\ 0.26 &= p && \text{Divide: } 13/50 = 0.26. \end{aligned}$$

Moving the decimal two places to the right, Hue captured 26% of the total vote. We must take 26% of 360° to determine the central angle of the sector representing Hue's portion of the votes.

$$\begin{aligned} 26\% \cdot 360^\circ &= 0.26 \cdot 360^\circ \\ &= 93.60^\circ \end{aligned}$$

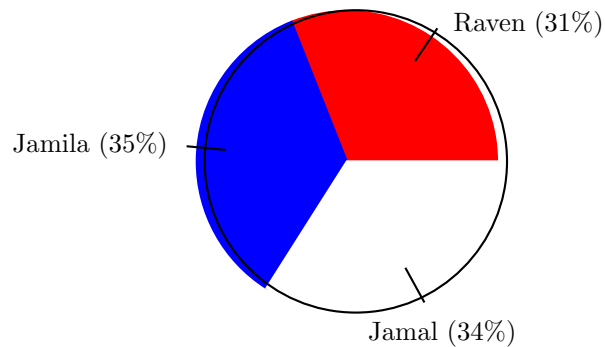
To round to the nearest degree, locate the rounding digit and the test digit.

$$9 \boxed{3} . \boxed{6} 0^\circ$$

↑ Rounding digit ↓ Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, to the nearest degree, the central angle of the sector representing Hue's portion of the vote is 94° .

13. In the figure, note that Raven received 31% of the total votes.



Because there were 95 votes cast, we must take 31% of 95 to determine the number of votes won by Raven.

$$\begin{aligned} \text{Votes for Raven} &= 31\% \cdot 95 \\ &= 0.31 \cdot 95 \\ &= 29.45 \end{aligned}$$

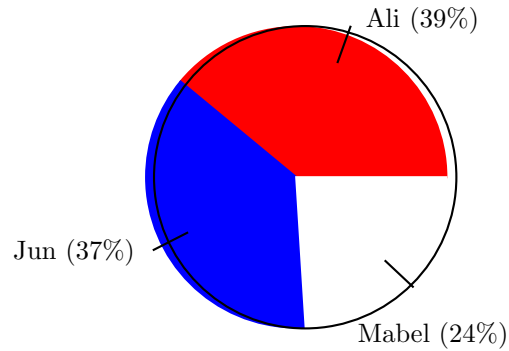
To round this number to the nearest vote, we must first identify the rounding digit and test digit.

$$2 \boxed{9} . \boxed{4} 5$$

↑ Rounding digit ↓ Test digit

Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, to the nearest vote, the number of votes awarded Raven is 29.

15. In the figure, note that Ali received 39% of the total votes.



Because there were 58 votes cast, we must take 39% of 58 to determine the number of votes won by Ali.

$$\begin{aligned} \text{Votes for Ali} &= 39\% \cdot 58 \\ &= 0.39 \cdot 58 \\ &= 22.62 \end{aligned}$$

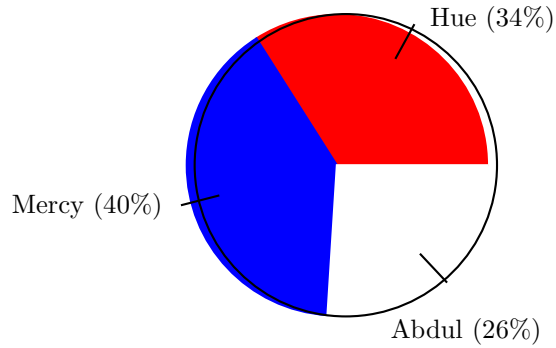
To round this number to the nearest vote, we must first identify the rounding digit and test digit.

$$2 \boxed{2} . \boxed{6} 2$$

↑ Rounding digit ↓ Test digit

Because the test digit is greater than or equal to 5, add 1 to the rounding digit, then truncate. Thus, to the nearest vote, the number of votes awarded Ali is 23.

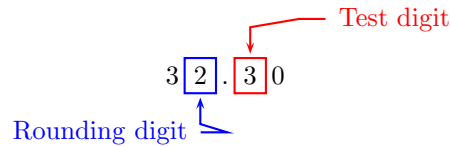
17. In the figure, note that Hue received 34% of the total votes.



Because there were 95 votes cast, we must take 34% of 95 to determine the number of votes won by Hue.

$$\begin{aligned}\text{Votes for Hue} &= 34\% \cdot 95 \\ &= 0.34 \cdot 95 \\ &= 32.30\end{aligned}$$

To round this number to the nearest vote, we must first identify the rounding digit and test digit.



Because the test digit is less than 5, leave the rounding digit alone, then truncate. Thus, to the nearest vote, the number of votes awarded Hue is 32.

19. The first task is to total the votes.

Candidate	Votes
Ali	45
Jamal	34
Jun	52
Totals	131

The next task is to express each quantity of votes as a percentage of the total votes. For example, Ali received 45 out of 131 votes.

Ali's votes	is	what percent	of	total votes
45	=	p	·	131

Solve for p .

$$45 = 131p \quad \text{Commutative property.}$$

$$\frac{45}{131} = \frac{131p}{131} \quad \text{Divide both sides by 131.}$$

$$0.3435 \approx p \quad \text{Divide: } 45/131 = 0.3435.$$

To the nearest tenth of a percent, Ali received 34.4% of the total votes. In similar fashion, calculate the percentage of votes earned by the remaining two candidates.

Candidate	Votes	Percent
Ali	45	34.4%
Jamal	34	26.0%
Jun	52	39.7%

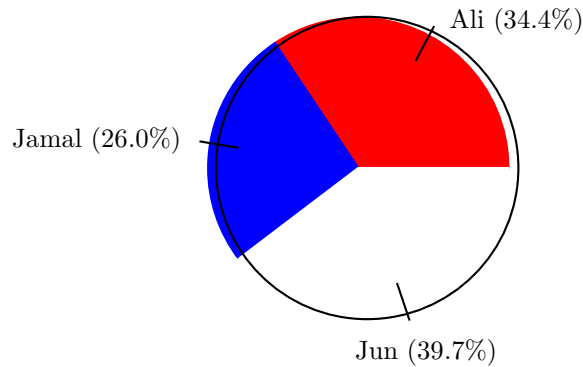
Next, calculate the degree measure of the central angle of the “pie” wedge for each candidate. In the case of Ali:

$$\begin{aligned} \text{Ali's degrees} &= 34.4\% \cdot 360^\circ \\ &= 0.344 \cdot 360^\circ \\ &= 123.84^\circ \end{aligned}$$

In similar fashion, calculate the degree measure of the central angle for each of the remaining candidates.

Candidate	Votes	Percent	Degrees
Ali	45	34.4%	123.84°
Jamal	34	26.0%	93.6°
Jun	52	39.7%	142.92°

Finally, take a protractor and measure three sectors with central angles from the Degrees column of the last table. Annotate each sector with the candidate's name and the percentage of votes received.



21. The first task is to total the votes.

Candidate	Votes
Bernardo	44
Rosa	40
Abdul	58
Totals	142

The next task is to express each quantity of votes as a percentage of the total votes. For example, Bernardo received 44 out of 142 votes.

$$\begin{array}{ccccccc} \text{Bernardo's votes} & \text{is} & \text{what percent} & \text{of} & \text{total votes} & & \\ 44 & = & p & \cdot & 142 & & \end{array}$$

Solve for p .

$$\begin{array}{ll} 44 = 142p & \text{Commutative property.} \\ \frac{44}{142} = \frac{142p}{142} & \text{Divide both sides by 142.} \\ 0.3098 \approx p & \text{Divide: } 44/142 = 0.3098. \end{array}$$

To the nearest tenth of a percent, Bernardo received 31.0% of the total votes. In similar fashion, calculate the percentage of votes earned by the remaining two candidates.

Candidate	Votes	Percent
Bernardo	44	31.0%
Rosa	40	28.2%
Abdul	58	40.8%

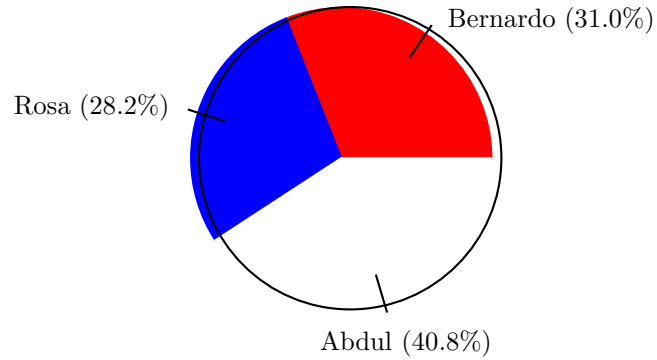
Next, calculate the degree measure of the central angle of the “pie” wedge for each candidate. In the case of Bernardo:

$$\begin{aligned} \text{Bernardo's degrees} &= 31.0\% \cdot 360^\circ \\ &= 0.310 \cdot 360^\circ \\ &= 111.6^\circ \end{aligned}$$

In similar fashion, calculate the degree measure of the central angle for each of the remaining candidates.

Candidate	Votes	Percent	Degrees
Bernardo	44	31.0%	111.6°
Rosa	40	28.2%	101.52°
Abdul	58	40.8%	146.88°

Finally, take a protractor and measure three sectors with central angles from the Degrees column of the last table. Annotate each sector with the candidate’s name and the percentage of votes received.



23. The first task is to total the votes.

Candidate	Votes
Mercy	56
Hans	53
Lisa	41
Totals	150

The next task is to express each quantity of votes as a percentage of the total votes. For example, Mercy received 56 out of 150 votes.

$$\begin{array}{ccccccc} \text{Mercy's votes} & \text{is} & \text{what percent} & \text{of} & \text{total votes} & & \\ 56 & = & p & \cdot & 150 & & \end{array}$$

Solve for p .

$$\begin{array}{ll} 56 = 150p & \text{Commutative property.} \\ \frac{56}{150} = \frac{150p}{150} & \text{Divide both sides by 150.} \\ 0.3733 \approx p & \text{Divide: } 56/150 = 0.3733. \end{array}$$

To the nearest tenth of a percent, Mercy received 37.3% of the total votes. In similar fashion, calculate the percentage of votes earned by the remaining two candidates.

Candidate	Votes	Percent
Mercy	56	37.3%
Hans	53	35.3%
Lisa	41	27.3%

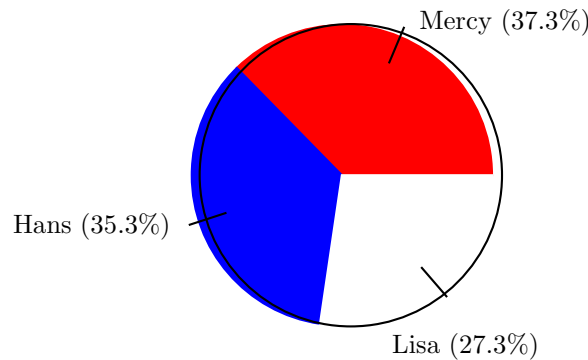
Next, calculate the degree measure of the central angle of the “pie” wedge for each candidate. In the case of Mercy:

$$\begin{aligned}\text{Mercy's degrees} &= 37.3\% \cdot 360^\circ \\ &= 0.373 \cdot 360^\circ \\ &= 134.28^\circ\end{aligned}$$

In similar fashion, calculate the degree measure of the central angle for each of the remaining candidates.

Candidate	Votes	Percent	Degrees
Mercy	56	37.3%	134.28°
Hans	53	35.3%	127.08°
Lisa	41	27.3%	98.28°

Finally, take a protractor and measure three sectors with central angles from the Degrees column of the last table. Annotate each sector with the candidate's name and the percentage of votes received.



25. The first task is to total the votes.

Candidate	Votes
Raven	43
Mabel	40
Bernardo	52
Totals	135

The next task is to express each quantity of votes as a percentage of the total votes. For example, Raven received 43 out of 135 votes.

Raven's votes	is	what percent	of	total votes
43	=	p	·	135

Solve for p .

$$43 = 135p \quad \text{Commutative property.}$$

$$\frac{43}{135} = \frac{135p}{135} \quad \text{Divide both sides by 135.}$$

$$0.3185 \approx p \quad \text{Divide: } 43/135 = 0.3185.$$

To the nearest tenth of a percent, Raven received 31.9% of the total votes. In similar fashion, calculate the percentage of votes earned by the remaining two candidates.

Candidate	Votes	Percent
Raven	43	31.9%
Mabel	40	29.6%
Bernardo	52	38.5%

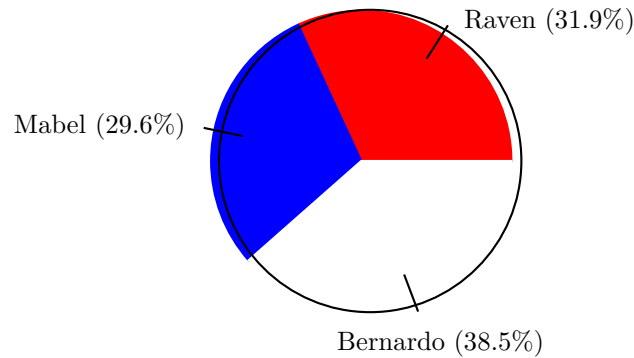
Next, calculate the degree measure of the central angle of the “pie” wedge for each candidate. In the case of Raven:

$$\begin{aligned} \text{Raven's degrees} &= 31.9\% \cdot 360^\circ \\ &= 0.319 \cdot 360^\circ \\ &= 114.84^\circ \end{aligned}$$

In similar fashion, calculate the degree measure of the central angle for each of the remaining candidates.

Candidate	Votes	Percent	Degrees
Raven	43	31.9%	114.84°
Mabel	40	29.6%	106.56°
Bernardo	52	38.5%	138.6°

Finally, take a protractor and measure three sectors with central angles from the Degrees column of the last table. Annotate each sector with the candidate's name and the percentage of votes received.



27. The first task is to total the votes.

Candidate	Votes
Jun	57
Lisa	30
Aisha	58
Totals	145

The next task is to express each quantity of votes as a percentage of the total votes. For example, Jun received 57 out of 145 votes.

Jun's votes	is	what percent	of	total votes
57	=	p	·	145

Solve for p .

$$57 = 145p \quad \text{Commutative property.}$$

$$\frac{57}{145} = \frac{145p}{145} \quad \text{Divide both sides by 145.}$$

$$0.3931 \approx p \quad \text{Divide: } 57/145 = 0.3931.$$

To the nearest tenth of a percent, Jun received 39.3% of the total votes. In similar fashion, calculate the percentage of votes earned by the remaining two candidates.

Candidate	Votes	Percent
Jun	57	39.3%
Lisa	30	20.7%
Aisha	58	40.0%

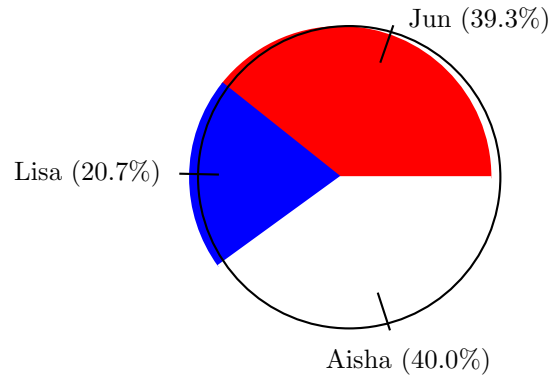
Next, calculate the degree measure of the central angle of the “pie” wedge for each candidate. In the case of Jun:

$$\begin{aligned} \text{Jun's degrees} &= 39.3\% \cdot 360^\circ \\ &= 0.393 \cdot 360^\circ \\ &= 141.48^\circ \end{aligned}$$

In similar fashion, calculate the degree measure of the central angle for each of the remaining candidates.

Candidate	Votes	Percent	Degrees
Jun	57	39.3%	141.48°
Lisa	30	20.7%	74.52°
Aisha	58	40.0%	144°

Finally, take a protractor and measure three sectors with central angles from the Degrees column of the last table. Annotate each sector with the candidate's name and the percentage of votes received.



29. The first task is to total the votes.

Candidate	Votes
Henry	35
Bernardo	32
Estevan	47
Totals	114

The next task is to express each quantity of votes as a percentage of the total votes. For example, Henry received 35 out of 114 votes.

$$\begin{array}{ccccccc} \text{Henry's votes} & \text{is} & \text{what percent} & \text{of} & \text{total votes} \\ 35 & = & p & \cdot & 114 \end{array}$$

Solve for p .

$$\begin{array}{ll} 35 = 114p & \text{Commutative property.} \\ \frac{35}{114} = \frac{114p}{114} & \text{Divide both sides by 114.} \\ 0.3070 \approx p & \text{Divide: } 35/114 = 0.3070. \end{array}$$

To the nearest tenth of a percent, Henry received 30.7% of the total votes. In similar fashion, calculate the percentage of votes earned by the remaining two candidates.

Candidate	Votes	Percent
Henry	35	30.7%
Bernardo	32	28.1%
Estevan	47	41.2%

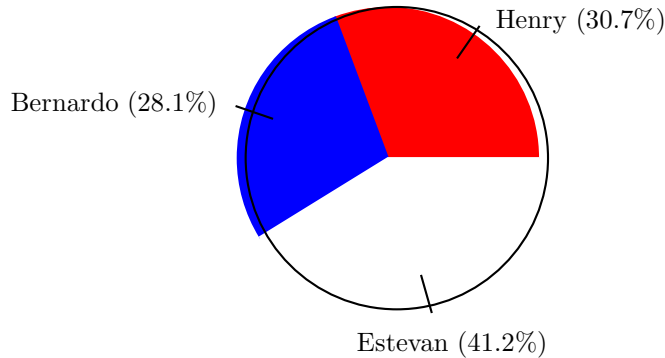
Next, calculate the degree measure of the central angle of the “pie” wedge for each candidate. In the case of Henry:

$$\begin{aligned}\text{Henry's degrees} &= 30.7\% \cdot 360^\circ \\ &= 0.307 \cdot 360^\circ \\ &= 110.52^\circ\end{aligned}$$

In similar fashion, calculate the degree measure of the central angle for each of the remaining candidates.

Candidate	Votes	Percent	Degrees
Henry	35	30.7%	110.52°
Bernardo	32	28.1%	101.16°
Estevan	47	41.2%	148.32°

Finally, take a protractor and measure three sectors with central angles from the Degrees column of the last table. Annotate each sector with the candidate's name and the percentage of votes received.



31. The first task is to find the total number of troops deployed.

Mission	Troops
Operation Iraqi Freedom	193,598
Operation Enduring Freedom (Afghanistan)	29,212
Other missions	35,849
Totals	258,659

The next task is to express the number of troops deployed for each mission as a percentage of the total number of troops. For example, Operation Iraqi Freedom deployed 193,598 out of the total 258,659 troops.

Iraq mission troops	is	what percent	of	total mission troops
193,598	=	p	·	258,659

Solve for p .

$$193,598 = 258,659p \quad \text{Commutative property.}$$

$$\frac{193,598}{258,659} = \frac{258,659p}{258,659} \quad \text{Divide both sides by 258,659.}$$

$$0.7484 \approx p \quad \text{Divide: } 193,598/258,659 = 0.7484.$$

To the nearest tenth of a percent, 74.8% of the total troops were deployed to the Iraq mission. In similar fashion, calculate the percentage of troops distributed among the remaining missions.

Candidate	Votes	Percent
Operation Iraqi Freedom	193,598	74.8%
Operation Enduring Freedom (Afghanistan)	29,212	11.3%
Other missions	35,849	13.9%

Next, calculate the degree measure of the central angle of the “pie” wedge for each candidate. In the case of troops deployed to Iraq:

$$\begin{aligned} \text{Iraq troops degrees} &= 74.8\% \cdot 360^\circ \\ &= 0.748 \cdot 360^\circ \\ &= 269.28^\circ \end{aligned}$$

In similar fashion, calculate the degree measure of the central angle for each of the remaining missions.

Mission	Troops	Percent	Degrees
Operation Iraqi Freedom	193,598	74.8%	269.28°
Operation Enduring Freedom (Afghanistan)	29,212	11.3%	40.68°
Other missions	35,849	13.9%	50.04°

Finally, take a protractor and measure three sectors with central angles from the Degrees column of the last table. Annotate each sector with the mission’s name and the percentage of troops deployed.

