

Solution

In the last column of Table 4.2.2, we can see that, just as the police department claims, car break ins are decreasing by a larger percentage each year—20% the first year, 25% the second year. However, notice that the absolute reduction in the number of car break-ins remains exactly 2 fewer each year. In 2021, a reduction of 2 break-ins equates to a 20% decrease, but in 2022 a reduction of 2 break-ins is a 25% decrease. Even though the number of break-ins reduces by the same amount from year to year, the absolute difference of 2 becomes a larger percentage of the shrinking overall number of break-ins. In other words, the reference point changes each year, causing the percentage decrease from year to year to become larger. You'll need to decide for yourself the validity of the department's claims since they are correct in saying that break-ins decreased by a larger *percentage* in 2022, although the *number* of break-ins decreased by the same amount for both years.

As Example 4.2.9 illustrates, it is always wise to have an eye on the underlying numbers before comparing percentages so that you do not fall victim to shifting reference points. We like to assume that these types of percentage faux pas examples are done unintentionally in society. But one does wonder if the cynical phrase “you can make numbers say anything you want” originates from exactly these types of occurrences.

Skill Check Answers

1. \$1.50, \$2.00 2. \$52.80 3. \$228.79, \$233.19 4. 64% 5. 43.8%

4.2 Exercises

✓ CONCEPT CHECK

1. The price of an item as it is listed for public sale is the _____.
2. The _____ is the actual cost of an item after any discounts are subtracted.
3. One way to apply a 4% tax to an amount is to multiply the amount by _____.
4. The _____ between two amounts is the absolute value of the difference between the two numbers.
5. The percentage change between two amounts is equal to the absolute change divided by the _____.

 PRACTICE

Find the absolute change and the percentage change for each situation.

- | | |
|------------------------------|------------------------------|
| 6. 270 is increased to 1134 | 7. 14 is increased to 70 |
| 8. 150 is decreased to 39 | 9. 475 is decreased to 152 |
| 10. 39 is increased to 69.42 | 11. 62 is decreased to 42.78 |

 APPLICATIONS

Solve. Round your answer to the nearest hundredth, if necessary.

12. After taking an Uber where the bill came to \$27.50, you decide to tip the driver 10%. How much will the tip be?
13. You and a group of 5 friends dined at a restaurant. When bringing the bill, the server tells you that a 15% tip is included automatically for groups of 6 or more. If your pretax bill was \$112.40, how much was the tip?
14. Sofia's bill at the hair salon was \$85. If she wants to tip 20%, how much tip will she leave?
15. Jaylon and his friend had a pizza delivered, and the bill was \$24.60. Jaylon says they should tip the driver 15%; his friend says 10% is sufficient. How much more would the driver receive if they tip 15%?
16. Kyle is getting a tattoo tomorrow and the artist told him the total will be \$225. If Kyle decides to tip 20%, what amount will he tip?
17. Cheryl ordered grocery delivery after her hip surgery. If her grocery bill was \$132.70 and she wants to tip the delivery driver 10%, how much will the tip be?
18. Your dinner bill was \$18.00. If you leave a 20% tip, how much will the tip be?
19. If you wish to leave a 15% tip and your bill is \$9.50, how much tip will you leave?
20. A furniture store advertises 30% off all couches for their grand opening sale. What would be the sale price of a couch originally priced at \$849.00?
21. A local coffee shop offers a 5% discount if you bring your own reusable mug. What is the discounted price of a cup of coffee that is normally \$2.80?
22. While shopping for a used car, Cait receives competing offers from two dealerships. Dealer A offers a 10% discount on a \$11,900 car; Dealer B offers a 15% discount on a \$12,400 car. After the discount, which dealer's car costs less?

23. An online company is advertising a Presto Pizza Oven on sale for 45% off the original price of \$69.99. What is the sale price for the oven?
24. A furniture store is having an annual sale where everything is 20% off and is offering an additional 15% off to anyone who finances through a store credit card. If the couch you are interested in originally costs \$950, how much would you need to finance if you used the store credit card?
25. A power washing company has a package to power wash your house, patio, and driveway for \$780. The company placed an ad in the local newspaper with a 15% off coupon and will take an additional 5% off if you place a sign advertising the company in your front lawn for a week. How much would you pay for the power washing service if you use the coupon and place the sign in your front lawn?
26. A catering company charges \$1200 to cater a small company lunch. The catering company offers a 10% discount if the lunch is scheduled more than six weeks ahead of time and an additional 10% discount if the payment is paid in full at the time of scheduling. How much would the catered lunch cost if it was scheduled 8 weeks ahead of time and paid in full at the time of booking?
27. At a local optometrist, the regular price of a new pair of prescription sunglasses, including lenses and frames, is \$380. The optometrist is offering a 20% discount on sunglasses to new patients. If a new patient has vision insurance that covers 20% of the cost of eyewear after any discounts, how much will the patient pay for a pair of prescription sunglasses?
28. An artist is selling limited edition prints of select paintings from their latest gallery show. If you purchase a set of three prints, you can save 10% on the total price. People who purchased prints from the previous print release receive a discount code for an additional 15% off during a presale. If you plan to purchase a set of three prints for a total of \$350, how much would you pay if you made the purchase during the presale?
29. A shirt is on sale for 40% off, and you have an additional 20% off coupon. True or false: The shirt will ultimately be 60% off the original price?
30. Get Lucky is having a clearance sale of their winter items. All sale items are marked an additional 10% off the sale price. If a coat that originally costs \$110 is on sale for 25% off, what is the new sale price? Is this a reduction of 35% off the original price?
31. A ticket to see Pink in concert costs \$117.80 at regular price. An online ticket company is offering tickets at a 25% discount. Your friend bought a ticket at the discounted price but found out he can't go. He's offering the ticket to you at an additional 10% off what he paid. What price could you get the concert ticket for if you bought it from your friend?
32. The wholesale cost of a new sofa is \$240. The price of the sofa is marked up 40% before putting it on the showroom floor. During a showroom sale, the sofa was marked down 40%. What is the price of the sofa now?

33. The stock price for KTD was \$54.56 in January 2014. In February the stock had increased by 6% but in March the price fell by 6%. What was the price of KTD stock in March 2014?
34. Liza stays overnight in a hotel that charges 6% sales tax plus a 2% lodging tax in addition to the price of the room. If the room price was \$109, what was her total bill?
35. A local restaurant is required to add a 5.5% sales tax plus a 1.5% hospitality tax to each patron's bill. Ignoring tip, if a customer's pre-tax bill is \$32.62, what would be the total bill?
36. A new wireless printer costs \$99.99 in the store. What would your total cost be if sales tax is 9.5%?
37. You purchase a pair of jeans with a list price of \$175. If the sales tax is 8.5%, what is the total cost of the jeans? Round your answer to the nearest cent.
38. Jamie found a receipt for an MP3 player for \$127.59, tax included. If the sales tax rate was 9%, what was the selling price of the MP3 player? Round your answer to the nearest cent.
39. The local sales tax is 8%. If a pair of shoes sells for \$115, what is the total cost after tax?
40. Your total purchase at a department store is \$173.56. The local sales tax is 8.75%. How much will you pay if you have a 30% store coupon?
41. A local store is having a sale. All waterproof shoes are 40% off. If a pair of rain boots normally costs \$13.72 plus 7% sales tax, how much will it cost to buy the rain boots during the sale? (**Hint:** Discounts are applied before sales tax is added.)
42. A coffee and a Danish from a local café cost \$6.15 plus a 6.25% tax. How much would a person spend on a breakfast of coffee and Danishes if they purchased this meal twice a week for a year (52 weeks)?
43. Two movie tickets, a medium popcorn, and two drinks costs \$40.50 plus a 7.75% sales tax. If a couple attends a movie once a month for a year, how much would they spend on tickets and concessions?
44. To complete an outfit for an upcoming event, you purchase shoes online for \$119.95 and decide to also buy a pack of socks for \$15. The sales tax applied to the full purchase price is 6.2%. What is the total purchase price of the shoes and socks?
45. Four pavilion seating tickets to see the Cleveland Orchestra during a summer concert costs a total of \$343. During the check out process, you are asked whether you'd like to make a donation to the orchestra and decide to donate \$50. If the sales tax is 6.75% and the donation is not taxed, what is the total price for the four tickets and the donation?

46. In Louisiana, a pack of cigarettes costs about \$4.82 plus 4% sales tax. How much would a person spend on cigarettes in a year in Louisiana if he smoked one pack of cigarettes on each of the 365 days of the year?
47. You owe \$257.43 on your credit card. Because you have not paid your bill on time, you have to add a past due charge of \$25, an over limit fee of \$40, and a service charge of 9% of the amount owed on the credit card (without the past due charge and over limit fees). If you wish to send a check for the full amount immediately, how much should you write the check for?

Solve each problem. Round your answer to the nearest hundredth, if necessary. (**Hint:** Commission is a percent of the house's selling price that is added to the realtor's income.)

48. You are selling your house with a realtor who earns a 7% commission fee. If your house sells for \$185,000, how much commission will the realtor earn?
49. If you are selling your house with a local realtor who requires a 6% commission fee, what can you expect to pay the realtor if your house sells for \$139,000?
50. Suppose you sell your house for \$215,000 but still owe \$175,000 on the mortgage. If your real estate agent gets a 6% commission, what is the amount of money you'll make on this sale?
51. You are about to list your house as For Sale By Owner. Suppose you need to allow for a 3% commission for the buyer's realtor, and you need to receive a minimum of \$92,500 on the sale. What is the minimum price you can list the house at to accommodate both of these requirements? Round to the nearest hundred dollars.
52. If a laptop computer regularly costs \$879 and is on sale for \$599, what percentage discount is being given?
53. A poll in Russia looked at the support of Vladimir Putin's United Russia party. At that time, United Russia held 315 of the 450 seats in the State Duma, but the poll predicted this would fall to 252. If this was the case when the elections happened, calculate the percentage change in the number of seats held by the United Russia party.
54. Suppose that a local newspaper reported that Cityville and Beautytown both had 50 murders last year. However, 5 years ago, Cityville had 42 murders while Beautytown had just 29. Calculate the absolute change and the percentage change for each city over the five years. Could the newspaper make the claim that crime had gone up by the same amounts in each city? Explain.
55. The United States population was estimated to be 312,681,446 in 2011, estimated to be 285,102,075 in 2001, and estimated to be 77,584,000 in 1901. Calculate the absolute change and percentage change between each of the figures given (that is, 1901 to 2001, 1901 to 2011, and 2001 to 2011).

56. In 2020, a total of 23.6 million people tuned in to watch the Oscars. In 2021, the viewership of the rewards show fell by 56%. How many people watched the Oscars in 2021? Round your answer to the nearest tenth of a million.
57. For the 1998–1999 academic year, the average cost of attending a public in-state college was \$12,000. By the 2018–2019 academic year, the average cost of attending a public in-state college increased by approximately 78%. What was the average cost of attending a public in-state college during the 2018–2019 academic year?
58. If the Chevron Corp stock increased 2.44% from \$102.73, what was the absolute change in stock price? Round your answer to the nearest cent.
59. Over a week, the average price of gas decreased by 18% from \$2.65 per gallon. What was the absolute change in gas price? Round your answer to the nearest cent.
60. Two companies decreased overhead costs by 12% during the last year. Suppose Company A originally had an overhead cost of \$85,000 and Company B originally had an overhead cost of \$1,250,000. Do you believe the decrease in overhead costs between the two companies was the same? Justify your answer.
61. A news outlet reported that fifty million Americans visited online retail sites on Black Friday, representing an increase of 35 percent versus a year ago. How many Americans visited online retail sites on Black Friday last year?
62. If Apple stock fell 0.93% from \$363.57 per share, what was the absolute change in stock price?
63. Two companies report a 15% gain in online sales over the last year. Suppose Company Q had 25 online sales and Company Z had 150 online sales last year. Do you believe their growth was the same? Justify your answer.

 **WRITING & THINKING**

64. You decide to interview 9th graders from two different schools on whether they agreed with school dress codes or not. Your interview revealed that 18% of the 600 9th graders from Riverside High agree with the school dress code, and 30% of the 50 9th graders from Lakeview High agree. Is it fair to say that the number of 9th graders from Lakeview High who agree with the dress code is almost twice that of the number of 9th graders from Riverside High? Explain your reasoning.