

\$900,000 and \$1,100,000 inclusive, over what range does the agent's commission vary? How does the commission vary as a percent of selling price?

106. **Sales Commission** A used car salesperson is paid a commission of \$25 plus 40% of the selling price in excess of owner's cost. The owner claims that used cars typically sell for at least owner's cost plus \$200 and at most owner's cost plus \$3000. For each sale made, over what range can the salesperson expect the commission to vary?
107. **Federal Tax Withholding** The percentage method of withholding for federal income tax (2006) states that a single person whose weekly wages, after subtracting withholding allowances, are over \$620, but not over \$1409, shall have \$78.30 plus 25% of the excess over \$620 withheld. Over what range does the amount withheld vary if the weekly wages vary from \$700 to \$900 inclusive?

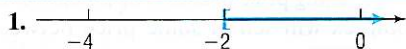
Source: Employer's Tax Guide. Department of the Treasury, Internal Revenue Service, Publication 2006.

108. **Exercising** Sue wants to lose weight. For healthy weight loss, the American College of Sports Medicine (ACSM) recommends 200 to 300 minutes of exercise per week. For the first six days of the week, Sue exercised 40, 45, 0, 50, 25, and 35 minutes. How long should Sue exercise on the seventh day in order to stay within the ACSM guidelines?
109. **Electricity Rates** Commonwealth Edison Company's charge for electricity in May 2006 is 8.275¢ per kilowatt-hour. In addition, each monthly bill contains a customer charge of \$7.58. If last year's bills ranged from a low of \$63.47 to a high of \$214.53, over what range did usage vary (in kilowatt-hours)?
- Source: Commonwealth Edison Co., Chicago, Illinois, 2006.*
110. **Water Bills** The Village of Oak Lawn charges homeowners \$28.84 per quarter-year plus \$2.28 per 1000 gallons for water usage in excess of 12,000 gallons. In 2006 one homeowner's quarterly bill ranged from a high of \$74.44 to a low of \$42.52. Over what range did water usage vary?
- Source: Village of Oak Lawn, Illinois, April 2006.*
111. **Markup of a New Car** The markup over dealer's cost of a new car ranges from 12% to 18%. If the sticker price is \$18,000, over what range will the dealer's cost vary?
112. **IQ Tests** A standard intelligence test has an average score of 100. According to statistical theory, of the people who take the test, the 2.5% with the highest scores will have scores of more than 1.96σ above the average, where σ (sigma, a number called the **standard deviation**) depends on the nature of the test. If $\sigma = 12$ for this test and there is (in principle) no upper limit to the score possible on the test, write the interval of possible test scores of the people in the top 2.5%.

Discussion and Writing

122. Make up an inequality that has no solution. Make up one that has exactly one solution.
123. The inequality $x^2 + 1 < -5$ has no real solution. Explain why.
124. Do you prefer to use inequality notation or interval notation to express the solution to an inequality? Give your reasons. Are there particular circumstances when you prefer one to the other? Cite examples.

'Are You Prepared?' Answers

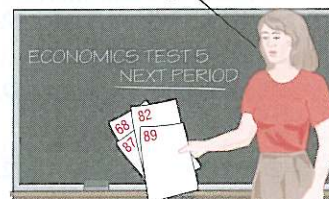


2. False

113. **Computing Grades** In your Economics 101 class, you have scores of 68, 82, 87, and 89 on the first four of five tests. To get a grade of B, the average of the first five test scores must be greater than or equal to 80 and less than 90.

- (a) Solve an inequality to find the range of the score that you need on the last test to get a B.
- (b) What score do you need if the fifth test counts double?

What do I need to get a B?



114. **"Light" Foods** For food products to be labeled "light," the U.S. Food and Drug Administration requires that the altered product must either contain one-third or fewer calories than the regular product or it must contain one-half or less fat than the regular product. If a serving of Miracle Whip[®] Light contains 20 calories and 1.5 grams of fat, then what must be true about either the number of calories or the grams of fat in a serving of regular Miracle Whip[®]?

115. **Arithmetic Mean** If $a < b$, show that $a < \frac{a+b}{2} < b$. The number $\frac{a+b}{2}$ is called the **arithmetic mean** of a and b .
116. Refer to Problem 115. Show that the arithmetic mean of a and b is equidistant from a and b .
117. **Geometric Mean** If $0 < a < b$, show that $a < \sqrt{ab} < b$. The number \sqrt{ab} is called the **geometric mean** of a and b .
118. Refer to Problems 115 and 117. Show that the geometric mean of a and b is less than the arithmetic mean of a and b .
119. **Harmonic Mean** For $0 < a < b$, let h be defined by

$$\frac{1}{h} = \frac{1}{2} \left(\frac{1}{a} + \frac{1}{b} \right)$$

Show that $a < h < b$. The number h is called the **harmonic mean** of a and b .

120. Refer to Problems 115, 117, and 119. Show that the harmonic mean of a and b equals the geometric mean squared divided by the arithmetic mean.
121. **Another Reciprocal Property** Prove that if $0 < a < b$, then $0 < \frac{1}{b} < \frac{1}{a}$.

125. How would you explain to a fellow student the underlying reason for the multiplication properties for inequalities (page 127), that is, the sense or direction of an inequality remains the same if each side is multiplied by a positive real number, whereas the direction is reversed if each side is multiplied by a negative real number.