Concept 1: Solving Linear Inequalities

For Exercises 9–46, solve the inequalities. Graph the solution and write the solution set in interval notation. Check each answer by using the test point method. (See Examples 1–4.)

9. $2y + 6 \leq 4$

10. $3y + 11 > 5$

11. $-2x - 5 \leq -25$

12. $-4z - 2 > -22$

13. $6z + 3 > 16$

14. $8w - 2 \leq 13$

15. $-8 > \frac{2}{3}t$

16. $-4 \leq \frac{1}{5}p$

17. $\frac{3}{4}(8y - 9) < 3$

18. $\frac{2}{5}(2x - 1) > 10$

19. $0.8a - 0.5 \leq 0.3a - 11$

20. $0.2w - 0.7 < 0.4 - 0.9w$

21. $-5x + 7 < 22$

22. $-3w - 6 > 9$

23. $-\frac{5}{6}x \leq -\frac{3}{4}$

24. $-\frac{3}{2}y > -\frac{21}{16}$

25. $\frac{3p - 1}{-2} > 5$

26. $\frac{3k - 2}{-5} \leq 4$

27. $0.2t + 1 > 2.4t - 10$

28. $20 \leq 8 - \frac{1}{3}x$

29. $3 - 4(y + 2) \leq 6 + 4(2y + 1)$

30. $1 + 4(b - 2) < 2(b - 5) + 4$

31. $7.2k - 5.1 \geq 5.7$

32. $6h - 2.92 \leq 16.58$

33. $-6p - 1 > 17$

34. $-4y + 1 \leq -11$

35. $\frac{3}{4}x - 8 \leq 1$

36. $-\frac{2}{5}a - 3 > 5$

37. $-1.2b - 0.4 \geq -0.4b$

38. $-0.4t + 1.2 < -2$

39. $-\frac{3}{4}c - \frac{5}{4} \geq 2c$

40. $-\frac{2}{3}q - \frac{1}{3} > \frac{1}{2}q$

41. $4 - 4(y - 2) < -5y + 6$

42. $6 - 6(k - 3) \geq -4k + 12$

43. $-6(2x + 1) < 5 - (x - 4) - 6x$

44. $2(4p + 3) - p \leq 5 + 3(p - 3)$

45. $6a - (9a + 1) - 3(a - 1) \geq 2$

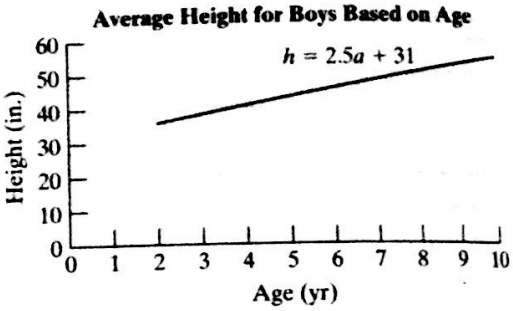
46. $8(q + 1) - (2q + 1) + 5 > 12$

Concept 2: Applications of Inequalities

47. Nadia received quiz grades of 80%, 86%, 73%, and 91%. (See Example 5.)
    a. What grade would she need to make on the fifth quiz to get a B average, that is, at least 80% but less than 90%?
    b. Is it possible for Nadia to get an A average for her quizzes (at least 90%)?

48. Ty received test grades of 78%, 75%, 71%, 83%, and 73%.
    a. What grade would he need to make on the sixth test to get a C if a C is at least 75% but less than 80%?
    b. Is it possible for Ty to get a B or better for his test average (at least 80%)?

For Exercises 49–52, use the graph that shows the average height for boys based on age. Let a represent a boy's age (in years) and let h represent his height(in inches). (See Example 6.)



49. Determine the age range for which the average height of boys is at least 51 in.

50. Determine the age range for which the average height of boys is greater than or equal to 41 in.

51. Determine the age range for which the average height of boys is no more than 46 in.

52. Determine the age range for which the average height of boys is at most 53.5 in.

53. Nolvia sells copy machines, and her salary is $25,000 plus a 4% commission on sales. The equation $S = 25{,}000 + 0.04x$ represents her salary S in dollars in terms of her total sales x in dollars.
    a. How much money in sales does Nolvia need to earn a salary that exceeds $40,000?
    b. How much money in sales does Nolvia need to earn a salary that exceeds $80,000?
    c. Why is the money in sales required to earn a salary of $80,000 more than twice the money in sales required to earn a salary of $40,000?

54. The amount of money A in a savings account depends on the principal P, the interest rate r, and the time in years t that the money is invested. The equation $A = P + Prt$ shows the relationship among the variables for an account earning simple interest. If an investor deposits $5000 at $6\frac{1}{2}\%$ simple interest, the account will grow according to the formula $A = 5000 + 5000(0.065)t$.
    a. How many years will it take for the investment to exceed $10,000? (Round to the nearest tenth of a year.)
    b. How many years will it take for the investment to exceed $15,000? (Round to the nearest tenth of a year.)

55. The revenue R for selling x fleece jackets is given by the equation $R = 49.95x$. The cost to produce x jackets is $C = 2300 + 18.50x$. Find the number of jackets that the company needs to sell to produce a profit. (*Hint:* A profit occurs when revenue exceeds cost.)

56. The revenue R for selling x mountain bikes is $R = 249.95x$. The cost to produce x bikes is $C = 56{,}000 + 140x$. Find the number of bikes that the company needs to sell to produce a profit.