

Answers to Clinical Reasoning Questions

- a. The nurse was accustomed to using 20 gtt/mL and calculated the IV rate using 20 gtt/mL. The tubing used at the institution delivered 10 gtt/mL, and the nurse did not check the drop factor on the IV set package. Failure to check the drop factor of the IV tubing resulted in an incorrect IV rate.
- b. Because of the excessive IV rate, the client developed signs of fluid overload and could have developed congestive heart failure.
- c. The nurse should never assume what the drop factor for IV tubing is for macrodrop administration sets because they can vary. The nurse should have checked the IV tubing package for the drop factor, which is printed on the package.

Answers to Chapter Review

NOTE

Many of the IV problems involving gtt/min could also be done by using the shortcut method or dimensional analysis.

NOTE

Some answers in the Chapter Review reflect the number of drops rounded to the nearest whole number and the rate in mL/hr.

1. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,000 \text{ mL}}{8 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 42 \text{ gtt/min}; 42 \text{ macrogtt/min}$$

2. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{2,500 \text{ mL}}{24 \text{ hr}}; x = 104 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{104 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 17 \text{ gtt/min}; 17 \text{ macrogtt/min}$$

3. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{4 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 31 \text{ gtt/min}; 31 \text{ macrogtt/min}$$

4. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{300 \text{ mL}}{6 \text{ hr}}; x = 50 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{50 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 50 \text{ gtt/min}; 50 \text{ microgtt/min}$$

5. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,000 \text{ mL}}{24 \text{ hr}}; x = 41.6 = 42 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{42 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 42 \text{ gtt/min}; 42 \text{ microgtt/min}$$

6. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{12 \text{ hr}}; x = 41.6 = 42 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{42 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 14 \text{ gtt/min}; 14 \text{ macrogtt/min}$$

7. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,000 \text{ mL}}{10 \text{ hr}}; x = 100 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{100 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 33 \text{ gtt/min}; 33 \text{ macrogtt/min}$$

8. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,500 \text{ mL}}{12 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 21 \text{ gtt/min}; 21 \text{ macrogtt/min}$$

9. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{4 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 21 \text{ gtt/min}; 21 \text{ macrogtt/min}$$

10. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{250 \text{ mL}}{4 \text{ hr}}; x = 63 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{63 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 11 \text{ gtt/min}; 11 \text{ macrogtt/min}$$

11. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,500 \text{ mL}}{8 \text{ hr}}; x = 188 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{188 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 63 \text{ gtt/min}; 63 \text{ macrogtt/min}$$

12. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{3,000 \text{ mL}}{24 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 31 \text{ gtt/min}; 31 \text{ macrogtt/min}$$

13. 1 L = 1,000 mL

$$2 \text{ L} = 2,000 \text{ mL}$$

- a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{2,000 \text{ mL}}{24 \text{ hr}}; x = 83 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{83 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 21 \text{ gtt/min}; 21 \text{ macrogtt/min}$$

14. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{4 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 125 \text{ gtt/min}; 125 \text{ microgtt/min}$$

15. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,000 \text{ mL}}{6 \text{ hr}}; x = 167 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{167 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 56 \text{ gtt/min}; 56 \text{ macrogtt/min}$$

16. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{250 \text{ mL}}{8 \text{ hr}}; x = 31 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{31 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 31 \text{ gtt/min}; 31 \text{ microgtt/min}$$

17.
$$x \text{ gtt/min} = \frac{50 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 50 \text{ gtt/min}; 50 \text{ microgtt/min}$$

18.
$$x \text{ gtt/min} = \frac{150 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 38 \text{ gtt/min}; 38 \text{ macrogtt/min}$$

19. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{6 \text{ hr}}; x = 83 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{83 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 21 \text{ gtt/min}; 21 \text{ macrogtt/min}$$

20. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,500 \text{ mL}}{12 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 21 \text{ gtt/min}; 21 \text{ macrogtt/min}$$

21. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,500 \text{ mL}}{24 \text{ hr}}; x = 63 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{63 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 16 \text{ gtt/min}; 16 \text{ macrogtt/min}$$

22. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{2,000 \text{ mL}}{16 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 42 \text{ gtt/min}; 42 \text{ macrogtt/min}$$

23. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{8 \text{ hr}}; x = 63 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{63 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 16 \text{ gtt/min}; 16 \text{ macrogtt/min}$$

24. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{250 \text{ mL}}{10 \text{ hr}}; x = 25 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{25 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 25 \text{ gtt/min}; 25 \text{ microgtt/min}$$

25. $x \text{ gtt/min} = \frac{75 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$

$$x = 75 \text{ gtt/min}; 75 \text{ microgtt/min}$$

26. $x \text{ gtt/min} = \frac{125 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$

$$x = 42 \text{ gtt/min}; 42 \text{ macrogtt/min}$$

27. $x \text{ gtt/min} = \frac{40 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$

$$x = 40 \text{ gtt/min}; 40 \text{ microgtt/min}$$

28. $x \text{ gtt/min} = \frac{50 \text{ mL} \times 60 \text{ gtt/mL}}{45 \text{ min}}$

$$x = 67 \text{ gtt/min}; 67 \text{ microgtt/min}$$

29. $x \text{ gtt/min} = \frac{90 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$

$$x = 23 \text{ gtt/min}; 23 \text{ macrogtt/min}$$

30. $x \text{ gtt/min} = \frac{150 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$

$$x = 25 \text{ gtt/min}; 25 \text{ macrogtt/min}$$

31. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{2,500 \text{ mL}}{24 \text{ hr}}; x = 104 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{104 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 26 \text{ gtt/min}; 26 \text{ macrogtt/min}$$

32. $x \text{ gtt/min} = \frac{50 \text{ mL} \times 10 \text{ gtt/mL}}{40 \text{ min}}$

$$x = 13 \text{ gtt/min}; 13 \text{ macrogtt/min}$$

33. $x \text{ gtt/min} = \frac{100 \text{ mL} \times 20 \text{ gtt/mL}}{30 \text{ min}}$

$$x = 67 \text{ gtt/min}; 67 \text{ macrogtt/min}$$

34. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{250 \text{ mL}}{5 \text{ hr}}; x = 50 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{50 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 17 \text{ gtt/min}; 17 \text{ macrogtt/min}$$

35. $x \text{ gtt/min} = \frac{80 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$

$$x = 27 \text{ gtt/min}; 27 \text{ macrogtt/min}$$

36. $x \text{ gtt/min} = \frac{150 \text{ mL} \times 10 \text{ gtt/mL}}{30 \text{ min}}$

$$x = 50 \text{ gtt/min}; 50 \text{ macrogtt/min}$$

37. $x \text{ gtt/min} = \frac{50 \text{ mL} \times 60 \text{ gtt/mL}}{30 \text{ min}}$

$$x = 100 \text{ gtt/min}; 100 \text{ microgtt/min}$$

38. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{3 \text{ hr}}; x = 167 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{167 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 28 \text{ gtt/min}; 28 \text{ macrogtt/min}$$

39. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{250 \text{ mL}}{2 \text{ hr}}; x = 125 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{125 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 31 \text{ gtt/min}; 31 \text{ macrogtt/min}$$

40. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,750 \text{ mL}}{24 \text{ hr}}; x = 73 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{73 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 12 \text{ gtt/min}; 12 \text{ macrogtt/min}$$

41. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{150 \text{ mL}}{1.5 \text{ hr}}; x = 100 \text{ mL/hr}$$

- b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{100 \text{ mL} \times 60 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 100 \text{ gtt/min}; 100 \text{ microgtt/min}$$

42. 1 L = 1,000 mL

2 L = 2,000 mL

$$x \text{ mL/hr} = \frac{2,000 \text{ mL}}{16 \text{ hr}}; x = 125 \text{ mL/hr}$$

43. $x \text{ mL/hr} = \frac{500 \text{ mL}}{4 \text{ hr}}; x = 125 \text{ mL/hr}$

44. $x \text{ mL/hr} = \frac{200 \text{ mL}}{2 \text{ hr}}; x = 100 \text{ mL/hr}$

45. $x \text{ mL/hr} = \frac{500 \text{ mL}}{8 \text{ hr}}; x = 63 \text{ mL/hr}$

46. Determine mL/hr.

$$x \text{ mL/hr} = \frac{1,100 \text{ mL}}{12 \text{ hr}}; x = 92 \text{ mL/hr}$$

47. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{6 \text{ hr}}; x = 83 \text{ mL/hr}$$

b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{83 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 14 \text{ gtt/min}; 14 \text{ macrogtt/min}$$

48. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{3,000 \text{ mL}}{20 \text{ hr}}; x = 150 \text{ mL/hr}$$

b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{150 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 50 \text{ gtt/min}; 50 \text{ macrogtt/min}$$

49. a. Determine mL/hr.

$$x \text{ mL/hr} = \frac{500 \text{ mL}}{6 \text{ hr}}; x = 83 \text{ mL/hr}$$

b. Calculate gtt/min.

$$x \text{ gtt/min} = \frac{83 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 21 \text{ gtt/min}; 21 \text{ macrogtt/min}$$

50. Time remaining = 7 hr

Volume remaining = 300 mL

a. Determine mL/hr for remaining solution.

$$x \text{ mL/hr} = \frac{300 \text{ mL}}{7 \text{ hr}}; x = 43 \text{ mL/hr}$$

b. Determine gtt/min (recalculated rate).

$$x \text{ gtt/min} = \frac{43 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 11 \text{ gtt/min}$$

Answer: 11 macrogtt/min; 11 gtt/min

c. Determine the percentage change.

$$\frac{11 - 13}{13} = \frac{-2}{13} = -0.153 = -15\%$$

The -15% is within the acceptable 25% variation.

Assess if client can tolerate adjustment in rate.

Negative percentage of variation (-15%) indicates the adjusted rate will be decreased. Assess client, check institution policy, and continue to assess client during rate change.

Determine accepted range of variation.

$$13 + (13 \div 4) = 13 + 3.25 = 16.25 = 16 \text{ gtt/min (macrogtt/min)}$$

$$13 - (13 \div 4) = 13 - 3.25 = 9.75 = 10 \text{ gtt/min (macrogtt/min)}$$

The acceptable range is 10–16 gtt/min (macrogtt/min).

The recalculated rate is 11 gtt/min (macrogtt/min).

It is safe to slow the IV rate to 11 gtt/min (macrogtt/min), which is in the safe range.

It is below 25% .

51. Time remaining = 4 hr

Volume remaining = 600 mL

a. Determine mL/hr for remaining solution.

$$x \text{ mL/hr} = \frac{600 \text{ mL}}{4 \text{ hr}}; x = 150 \text{ mL/hr}$$

b. Determine gtt/min (recalculated rate).

$$x \text{ gtt/min} = \frac{150 \text{ mL} \times 20 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 50 \text{ gtt/min}$$

Answer: 50 gtt/min; 50 macrogtt/min

c. Determine the percentage change.

$$\frac{50 - 42}{42} = \frac{8}{42} = 0.190 = 19\%$$

The percentage of change is 19% . This is an acceptable increase. Assess if client can tolerate the adjustment in rate (42 gtt/min to 50 gtt/min). Check if allowed by institution policy. Assess client during rate change.

Determine accepted range of variation.

$$42 + (42 \div 4) = 42 + 10.5 = 52.5 = 53 \text{ gtt/min (macrodrop)}$$

$$42 - (42 \div 4) = 42 - 10.5 = 31.5 = 32 \text{ gtt/min (macrodrop)}$$

The acceptable range is 32–53 gtt/min (macrodrop).

The recalculated rate is 50 gtt/min (macrodrop). The IV increase to 50 gtt/min (macrogtt) is within the safe range of 25% .

52. Time remaining = 4 hr

Volume remaining = 400 mL

a. Determine mL/hr for remaining solution.

$$x \text{ mL/hr} = \frac{400 \text{ mL}}{4 \text{ hr}}; x = 100 \text{ mL/hr}$$

After determining mL/hr, gtt/min is recalculated.

b. Determine gtt/min (recalculated rate).

$$x \text{ gtt/min} = \frac{100 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 25 \text{ gtt/min}$$

Answer: 25 gtt/min; 25 macrogtt/min

- c. The IV was ahead. The original IV order was 125 mL/hr = 31 gtt/min (31 macrogtt/min). The IV would have to be decreased from 31 gtt/min (31 macrogtt/min) to 25 gtt/min (25 macrogtt/min). Determine the percentage change.

$$\frac{25 - 31}{31} = \frac{-6}{31} = -0.193 = -19\%$$

The -19% is within acceptable 25% variation. Assess if client can tolerate the adjustment in rate. Negative percentage of variation (-19%) indicates the adjusted rate will be decreased. Check institution policy. Assess client during rate change.

Determine accepted range of variation.

$$31 + (31 \div 4) = 31 + 7.75 = 38.75 = 39 \text{ gtt/min (macrogtt/min)}$$

$$31 - (31 \div 4) = 31 - 7.75 = 23.25 = 23 \text{ gtt/min (macrogtt/min)}$$

The accepted range is 23–39 gtt/min (macrogtt). The recalculated rate is 25 gtt/min (macrogtt/min). It is safe to slow the rate to 25 gtt/min (macrogtt/min) which is within the safe range of 25%.

53. Time remaining = 5 hr

Volume remaining = 250 mL

- a. Determine mL/hr for remaining solution.

$$x \text{ mL/hr} = \frac{250 \text{ mL}}{5 \text{ hr}}; x = 50 \text{ mL/hr}$$

- b. Determine gtt/min (recalculated rate).

$$x \text{ gtt/min} = \frac{50 \text{ mL} \times 10 \text{ gtt/mL}}{60 \text{ min}}$$

$$x = 8 \text{ gtt/min}$$

Answer: 8 gtt/min; 8 macrogtt/min

- c. The IV is ahead. The IV rate would need to be decreased from 14 gtt/min (14 macrogtt/min) to 8 gtt/min (8 macrogtt/min). Determine the percentage change.

$$\frac{8 - 14}{14} = \frac{-6}{14} = -0.428 = -43\%$$

The percentage of change is less than 25%. Assess client. Check with prescriber; order may need to be revised even though a negative variation indicates IV will be decreased. (Do not decrease.)

Determine accepted range of variation.

$$14 + (14 \div 4) = 14 + 3.5 = 17.5 = 18 \text{ gtt/min (macrogtt/min)}$$

$$14 - (14 \div 4) = 14 - 3.5 = 10.5 = 11 \text{ gtt/min (macrogtt/min)}$$

The accepted range is 11–18 gtt/min (macrogtt/min). The recalculated rate is 8 gtt/min (macrogtt/min). The IV is less than 25%.

54. Time remaining = 4 hr

Volume remaining = 600 mL

- a. Determine mL/hr for remaining solution.

$$x \text{ mL/hr} = \frac{600 \text{ mL}}{4 \text{ hr}}; x = 150 \text{ mL/hr}$$

- b. Determine gtt/min (recalculated rate).

$$x \text{ gtt/min} = \frac{150 \text{ mL} \times 15 \text{ gtt/mL}}{60 \text{ min}} = 38 \text{ gtt/min}$$

Answer: 38 gtt/min; 38 macrogtt/min

- c. IV is not on schedule. The original IV order was 100 mL/hr = 25 gtt/min (25 macrogtt/min). The IV would have to be increased from 25 gtt/min (25 macrogtt/min) to 38 gtt/min (38 macrogtt/min). Determine the percentage of increase.

$$\frac{38 - 25}{25} = \frac{13}{25} = 52\%$$

The percentage of change is greater than 25%. Assess client. Check with prescriber; order may need to be revised. (Do not increase.)

Determine accepted range of variation.

$$25 + (25 \div 4) = 25 + 6.25 = 31.25 = 31 \text{ gtt/min (macrogtt/min)}$$

$$25 - (25 \div 4) = 25 - 6.25 = 18.75 = 19 \text{ gtt/min (macrogtt/min)}$$

The accepted range is 19–31 gtt/min (macrogtt/min). The recalculated rate is 38 gtt/min (macrogtt/min). The IV is more than 25% which is not in the safe range.

55. 80 macrogtt/min (80 gtt/min) =

$$\frac{900 \text{ mL} \times 15 \text{ gtt/mL}}{x \text{ min}}$$

$$80 = \frac{900 \times 15}{x}$$

$$\frac{80x}{80} = \frac{13,500}{80}$$

$$x = 168.75 \text{ minutes}$$

$$60 \text{ min} = 1 \text{ hr}; 168.75 \div 60 = 2.81 \text{ hr}$$

Time: 2.81 hr. Since 0.81 represents a fraction of an additional hour, $0.81 \text{ hr} \times 60 \text{ min/hr} = 48.6 = 49 \text{ min}$.

Answer: 2 hr and 49 min

56. $\frac{1,000 \text{ mL}}{100 \text{ mL/hr}} = 10 \text{ hr}$