PRACTICE EXAM 7: CHART AND CALCULATION INTENSIVE — 105 QUESTIONS

1. A flight covers 90 nautical miles at a groundspeed of 180 knots. How long does the leg take?

A. 45 minutes

B. 30 minutes

C. 20 minutes

2. An airplane burns 12 gallons per hour and flies for 1.5 hours. How much fuel is consumed?

A. 18 gallons

B. 15 gallons

C. 24 gallons

3. An item weighs 250 pounds at an arm of 80 inches. What is its moment?

A. 3,330 lb-in

B. 330 lb-in

C. 20,000 lb-in

4. A field is at 4,000 feet elevation with an altimeter setting of 29.42 in. Hg. Using 1,000 feet per inch of mercury, what is the pressure altitude?

A. 3,500 feet

B. 4,000 feet

C. 4,500 feet

5. The wind is 20 knots at 30° off the runway. What is the approximate crosswind component?

A. 10 knots

B. 17 knots

C. 20 knots

6. A flight covers 120 nautical miles at a groundspeed of 160 knots. How long does it take?

A. 45 minutes

B. 30 minutes

C. 60 minutes

7. A pilot moves 60 pounds a distance of 50 inches in an airplane with a total weight of 2,400 pounds. How far does the CG move?

A. 2.50 inches

B. 1.25 inches

C. 0.75 inch

8. A winds-aloft group reads "7799." What does it indicate?

A. Wind from 077° at 99 knots

B. Light and variable winds

C. Wind from 270° at 199 knots

9. An airplane has 48 gallons of usable fuel and burns 12 gallons per hour. What is its endurance?

A. 6 hours

B. 4 hours

C. 3 hours

10. A runway is aligned to a magnetic heading of 273°. What is its runway number?

A. Runway 27

B. Runway 28

C. Runway 7

11. A pilot needs to estimate a takeoff distance at 3,000 feet, where the chart lists 1,000 feet at 2,000 feet and 1,400 feet at 4,000 feet. Using interpolation, what is the estimated distance?

A. 1,200 feet

B. 1,000 feet

C. 1,400 feet

12. A flight covers 45 nautical miles at a groundspeed of 135 knots. How long does it take?

A. 30 minutes

B. 25 minutes

C. 20 minutes

13. An airplane burns 8.5 gallons per hour for 2 hours. How much fuel is used?

A. 17 gallons

B. 15 gallons

C. 19 gallons

14. A pilot must convert 30 gallons of fuel to weight at 6 pounds per gallon. What is the weight?

A. 150 pounds

B. 180 pounds

C. 210 pounds

15. A true airspeed of 120 knots with a 25-knot headwind produces what groundspeed?

A. 95 knots

B. 145 knots

C. 120 knots

16. A winds-aloft group reads "2435+05." What wind does it represent?

A. Wind from 024° at 35 knots

B. Wind from 243° at 5 knots

C. Wind from 240° at 35 knots

17. A 60° bank level turn produces a 2 G load factor. By approximately what percentage does the stall speed increase?

A. 100%

B. 20%

C. 41%

18. An airplane covers 100 nautical miles in 40 minutes. What is its groundspeed?

A. 120 knots

B. 150 knots

C. 175 knots

19. A pilot must determine fuel for a 75-NM leg at 150 knots groundspeed, burning 10 gallons per hour. How much fuel is needed?

A. 7.5 gallons

B. 5 gallons

C. 10 gallons

20. The standard temperature at 4,000 feet, using 15°C at sea level and 2°C per 1,000 feet, is what?

A. +7°C

B. +5°C

C. +3°C

21. A field is at 2,000 feet with an altimeter setting of 30.42 in. Hg. What is the pressure altitude?

A. 2,500 feet

B. 2,000 feet

C. 1,500 feet

22. An item weighing 200 pounds is at an arm of 60 inches, and another weighing 100 pounds is at an arm of 40 inches. What is the total moment?

A. 16,000 lb-in

B. 12,000 lb-in

C. 10,000 lb-in

23. A pilot must determine the distance covered at 140 knots groundspeed in 30 minutes. How far?

A. 70 nautical miles

B. 60 nautical miles

C. 80 nautical miles

24. The wind is 20 knots at 60° off the runway. What is the approximate crosswind component?

A. 10 knots

B. 17 knots

C. 20 knots

25. A true airspeed of 105 knots with an 18-knot tailwind produces what groundspeed?

A. 123 knots

B. 87 knots

C. 105 knots

26. A pilot computes a density altitude at a pressure altitude of 4,000 feet with a temperature of 25°C (standard is 7°C). Using 120 feet per degree, what is the approximate density altitude?

A. 4,000 feet

B. 5,200 feet

C. 6,160 feet

27. A pilot must move the CG forward by 2 inches in a 2,000-pound airplane by shifting weight 100 inches. How much weight must be moved?

A. 40 pounds

B. 25 pounds

C. 60 pounds

28. A runway is aligned to a magnetic heading of 355°. What is its runway number?

A. Runway 35

B. Runway 36

C. Runway 1

29. A pilot moves 80 pounds a distance of 30 inches in a 2,000-pound airplane. How far does the CG move?

A. 2.0 inches

B. 1.2 inches

C. 0.8 inch

30. A flight plan shows a leg of 70 nautical miles. At a groundspeed of 140 knots, how long does it take?

A. 45 minutes

B. 25 minutes

C. 30 minutes

31. A pilot reads a chart that requires interpolation between 2,000 and 4,000 feet for a value at 3,000 feet. What technique applies?

A. Round up to the 4,000-foot value

B. Use the 2,000-foot value to be conservative

C. Interpolate to find the value halfway between

32. An airplane's basic empty weight is 1,800 pounds, with a pilot and passenger at 340 pounds, rear passengers at 120 pounds, and baggage at 90 pounds. What is the total weight?

A. 2,250 pounds

B. 2,350 pounds

C. 2,450 pounds

33. A true airspeed of 110 knots into a headwind yields a groundspeed of 90 knots. What is the headwind component?

A. 20 knots

B. 15 knots

C. 25 knots

34. A pilot must compute the CG of an airplane with a total moment of 98,100 lb-in and a total weight of 2,350 pounds. What is the CG, rounded?

A. 41.74 inches

B. 38.00 inches

C. 45.00 inches

35. The wind is 28 knots at 45° off the runway. What is the approximate crosswind component?

A. 14 knots

B. 28 knots

C. 20 knots

36. A pilot must determine time for a 60-NM diversion at a groundspeed of 120 knots. How long?

A. 45 minutes

B. 30 minutes

C. 20 minutes

37. A winds-aloft forecast omits temperature for altitudes within how many feet of the station elevation?

A. 1,000 feet

B. 1,500 feet

C. 2,500 feet

38. A pilot must determine the fuel weight for 25 gallons at 6 pounds per gallon. What is it?

A. 150 pounds

B. 180 pounds

C. 120 pounds

39. At a groundspeed of 120 knots, how far does the airplane travel in one minute?

A. 2 nautical miles

B. 1 nautical mile

C. 3 nautical miles

40. A flight covers 150 nautical miles at a groundspeed of 150 knots. How long does it take?

A. 30 minutes

B. 60 minutes

C. 90 minutes

41. A pilot must determine the pressure altitude at a field elevation of 4,000 feet with an altimeter setting below standard (29.42 in. Hg). What is the effect?

A. Pressure altitude is lower than field elevation

B. Pressure altitude is higher than field elevation

C. Pressure altitude equals field elevation exactly

42. A pilot computes the moment of a 150-pound passenger at an arm of 40 inches. What is the moment?

A. 3.75 lb-in

B. 190 lb-in

C. 6,000 lb-in

43. A pilot must determine groundspeed with a true airspeed of 95 knots and a 20-knot tailwind. What is it?

A. 75 knots

B. 95 knots

C. 115 knots

44. A density altitude calculation shows a value much higher than field elevation on a hot day. What does this mean for takeoff distance?

A. The takeoff distance will increase

B. The takeoff distance will decrease

C. The takeoff distance is unaffected

45. A runway is aligned to a magnetic heading of 045°. What is its runway number?

A. Runway 45

B. Runway 4

C. Runway 5

46. A pilot must determine the time for a 90-NM leg at a groundspeed of 135 knots. How long?

A. 40 minutes

B. 30 minutes

C. 50 minutes

47. A pilot computes that shifting 100 pounds aft by 20 inches in a 2,500-pound airplane moves the CG how far aft?

A. 1.25 inches

B. 0.40 inch

C. 0.80 inch

48. A winds-aloft group reads "9900." What does it indicate?

A. Wind from 099° at 100 knots

B. Calm with a temperature of 0°C

C. Light and variable winds, less than 5 knots

49. A pilot must determine the headwind component when the wind is 15 knots straight down the runway (0° off). What is it?

A. 0 knots

B. 15 knots

C. 7.5 knots

50. A pilot computes endurance for an airplane with 60 gallons usable burning 15 gallons per hour. What is the endurance?

A. 3 hours

B. 4 hours

C. 5 hours

51. A pilot must determine the distance flown in 45 minutes at a groundspeed of 160 knots. How far?

A. 120 nautical miles

B. 100 nautical miles

C. 140 nautical miles

52. A pilot reads a temperature/dewpoint of 20°C/10°C. Using the spread divided by 2.5, multiplied by 1,000, what is the approximate cloud base?

A. 2,000 feet AGL

B. 6,000 feet AGL

C. 4,000 feet AGL

53. A pilot must verify that the CG falls within the envelope. The computed CG is 41.74 inches with limits of 35.0 to 47.3 inches. Is it within limits?

A. Yes, the CG is within the forward and aft limits

B. No, the CG is forward of the limit

C. No, the CG is aft of the limit

54. A flight leg of 80 nautical miles is flown at a groundspeed of 120 knots. How long does it take?

A. 30 minutes

B. 40 minutes

C. 50 minutes

55. A pilot must determine the fuel for a 2-hour flight burning 8.5 gallons per hour, plus a 45-minute night reserve at the same rate. What total fuel is required?

A. 17.0 gallons

B. 23.4 gallons

C. 25.5 gallons

56. A pilot reads a winds-aloft group "2440." What wind does it represent?

A. Wind from 024° at 40 knots

B. Wind from 244° at 0 knots

C. Wind from 240° at 40 knots

57. A pilot must compute the time to climb if the rate is 500 feet per minute and the altitude gain needed is 4,000 feet. How long?

A. 8 minutes

B. 4 minutes

C. 10 minutes

58. A pilot determines that a tailwind component on landing is 10 knots. What is the general effect on landing distance?

A. It decreases the landing distance

B. It has no effect

C. It increases the landing distance

59. A pilot must convert a true course measurement to determine total distance using the latitude scale. One minute of latitude equals what?

A. One statute mile

B. One nautical mile

C. One kilometer

60. A pilot computes that the airplane needs 5 gallons for a 75-NM leg at 150 knots groundspeed burning 10 gph, plus a 30-minute day reserve at 10 gph. What total fuel is required?

A. 5 gallons

B. 7.5 gallons

C. 10 gallons

61. A pilot must determine the CG when all items are loaded at the same arm of 40 inches. What is the CG?

A. 40 inches

B. 38 inches

C. 42 inches

62. A pilot reads a chart value of 1,000 feet at 2,000 feet pressure altitude and 1,400 feet at 4,000 feet. What is the value at 3,000 feet?

A. 1,200 feet

B. 1,100 feet

C. 1,300 feet

63. A pilot computes a 45° crosswind from a 28-knot wind. What is the approximate crosswind component?

A. 14 knots

B. 20 knots

C. 28 knots

64. A pilot must determine the groundspeed for a 100-NM leg flown in exactly 40 minutes. What is it?

A. 120 knots

B. 140 knots

C. 150 knots

65. A pilot computes the pressure altitude at a field at 2,000 feet with an altimeter setting of 30.42 in. Hg (above standard). What is the result?

A. 2,500 feet

B. 1,500 feet

C. 2,000 feet

66. A pilot must determine the moment of a 250-pound load at an arm of 80 inches. What is it?

A. 20,000 lb-in

B. 3,330 lb-in

C. 330 lb-in

67. A pilot computes that a 1°C rise above standard temperature increases density altitude by approximately how much?

A. 50 feet

B. 120 feet

C. 200 feet

68. A pilot must determine the time for a 90-NM leg at 180 knots groundspeed. How long?

A. 45 minutes

B. 20 minutes

C. 30 minutes

69. A pilot computes the CG change when shifting 60 pounds 50 inches in a 2,400-pound airplane. What is the change?

A. 2.50 inches

B. 1.25 inches

C. 0.60 inch

70. A pilot must convert 110 knots true airspeed with a 25-knot headwind to groundspeed. What is it?

A. 85 knots

B. 135 knots

C. 110 knots

71. A pilot reads a runway heading of 180°. What is the runway number?

A. Runway 18

B. Runway 8

C. Runway 36

72. A pilot computes endurance for 48 gallons usable at 12 gallons per hour. What is it?

A. 3 hours

B. 5 hours

C. 4 hours

73. A pilot must determine the crosswind component for a 15-knot wind at 90° to the runway. What is it?

A. 15 knots

B. 7.5 knots

C. 0 knots

74. A pilot computes a total weight of 2,350 pounds with a maximum gross of 2,550 pounds. Is the weight acceptable?

A. No, the airplane is overweight

B. Yes, the weight is within maximum gross

C. The weight cannot be determined

75. A pilot must determine fuel weight for 20 gallons at 6 pounds per gallon. What is it?

A. 100 pounds

B. 120 pounds

C. 140 pounds

76. A pilot reads a winds-aloft group with a coded direction greater than 36. What rule applies?

A. The forecast is in error and should be ignored

B. The speed is read directly without adjustment

C. Subtract 50 from the direction and add 100 to the speed

77. A pilot computes the distance flown in 30 minutes at 140 knots. How far?

A. 70 nautical miles

B. 60 nautical miles

C. 80 nautical miles

78. A pilot must determine the CG change when shifting 80 pounds 30 inches in a 2,000-pound airplane. What is it?

A. 2.0 inches

B. 1.5 inches

C. 1.2 inches

79. A pilot computes the groundspeed for a 105-knot true airspeed with an 18-knot tailwind. What is it?

A. 87 knots

B. 123 knots

C. 105 knots

80. A pilot reads a runway heading of 045°. What is the runway number?

A. Runway 45

B. Runway 5

C. Runway 4

81. A pilot must determine the time for a 45-NM leg at 135 knots. How long?

A. 20 minutes

B. 30 minutes

C. 15 minutes

82. A pilot computes a density altitude that is 2,160 feet above a 4,000-foot pressure altitude on a hot day. What is the density altitude?

A. 6,160 feet

B. 4,000 feet

C. 5,000 feet

83. A pilot must determine fuel used in 1.5 hours at 12 gallons per hour. How much?

A. 12 gallons

B. 15 gallons

C. 18 gallons

84. A pilot reads a temperature of 12°C and dewpoint of 11°C in a METAR. What does the 1°C spread indicate?

A. Very dry air with excellent visibility

B. Air near saturation, favoring clouds or fog

C. A strong temperature inversion

85. A pilot computes the moment of a 150-pound passenger at an arm of 40 inches. What is it?

A. 3.75 lb-in

B. 190 lb-in

C. 6,000 lb-in

86. A pilot must determine the headwind component for a 20-knot wind at 30° off the runway. What is it?

A. 17 knots

B. 10 knots

C. 20 knots

87. A pilot computes a leg of 120 NM at 160 knots groundspeed. How long does it take?

A. 30 minutes

B. 60 minutes

C. 45 minutes

88. A pilot reads a winds-aloft group "2435." What wind does it represent?

A. Wind from 024° at 35 knots

B. Wind from 240° at 35 knots

C. Wind from 243° at 5 knots

89. A pilot must determine the CG when total moment is 98,100 lb-in and total weight is 2,350 pounds. What is the CG?

A. 38.0 inches

B. 41.7 inches

C. 45.0 inches

90. A pilot computes the time to fly 70 NM at 140 knots. How long?

A. 30 minutes

B. 20 minutes

C. 45 minutes

91. A pilot must determine the effect on density altitude of an altimeter setting above 29.92 in. Hg compared with field elevation.

A. Pressure altitude is lower than field elevation

B. Pressure altitude is higher than field elevation

C. Pressure altitude equals field elevation

92. A pilot computes that shifting weight to move the CG must satisfy the relationship "(weight × distance) ÷ total weight." What does this yield?

A. The total moment of the airplane

B. The CG change resulting from the shift

C. The total weight after the shift

93. A pilot reads a runway heading of 355°. What is the runway number?

A. Runway 35

B. Runway 1

C. Runway 36

94. A pilot must determine groundspeed for 90 NM flown in 30 minutes. What is it?

A. 150 knots

B. 120 knots

C. 180 knots

95. A pilot computes a 60° crosswind from a 20-knot wind. What is the approximate crosswind component?

A. 17 knots

B. 20 knots

C. 10 knots

96. A pilot must determine the moment of an 1,800-pound empty airplane at an arm of 38 inches. What is it?

A. 68,400 lb-in

B. 47,400 lb-in

C. 1,838 lb-in

97. A pilot computes that the airplane covers 2 nautical miles per minute. What is the groundspeed?

A. 120 knots

B. 60 knots

C. 100 knots

98. A pilot must determine the fuel for a 40-minute leg at 9 gallons per hour. How much?

A. 9 gallons

B. 6 gallons

C. 4 gallons

99. A pilot reads a chart requiring interpolation and gets a value between the two listed entries. What does this confirm about the method?

A. Rounding was used instead of interpolation

B. The lower value was selected

C. Interpolation produced a value between the two known entries

100. A pilot computes a 90-NM leg at 135 knots groundspeed. How long does it take?

A. 30 minutes

B. 40 minutes

C. 50 minutes

101. A pilot must determine the CG when shifting 100 pounds 20 inches aft in a 2,500-pound airplane. How far does the CG move?

A. 0.80 inch

B. 1.25 inches

C. 0.40 inch

102. A pilot computes the fuel weight for 30 gallons at 6 pounds per gallon. What is it?

A. 150 pounds

B. 180 pounds

C. 210 pounds

103. A pilot reads "BKN008 OVC015" in a METAR. What is the ceiling?

A. 1,500 feet AGL

B. No ceiling

C. 800 feet AGL

104. A pilot must determine the time to climb 4,000 feet at 500 feet per minute. How long?

A. 4 minutes

B. 6 minutes

C. 8 minutes

105. A pilot computes the distance flown at 140 knots groundspeed over 30 minutes. How far?

A. 70 nautical miles

B. 60 nautical miles

C. 80 nautical miles

Exam 7 Answer Key with Full Answer Explanations

1. B — Time equals distance divided by groundspeed: 90 ÷ 180 = 0.5 hour = 30 minutes. At 180 knots the airplane covers 3 NM per minute. The time-speed-distance relationship is fundamental.

2. A — Fuel equals rate times time: 12 × 1.5 = 18 gallons. This is the basic fuel-burn relationship. It underlies fuel planning.

3. C — Moment equals weight times arm: 250 × 80 = 20,000 lb-in. The moment is the turning tendency about the datum. It is the basis of the CG computation.

4. C — With the altimeter 0.50 in. Hg below standard and about 1,000 feet per inch, pressure altitude is 500 feet above the 4,000-foot field elevation: 4,500 feet. A setting below 29.92 raises pressure altitude. The relationship is inverse to the setting.

5. A — The crosswind component equals wind speed times the sine of the angle: 20 × sin(30°) = 20 × 0.5 = 10 knots. The 30° angle gives a convenient half-of-wind crosswind. The headwind component would be about 17 knots.

6. A — Time equals distance divided by groundspeed: 120 ÷ 160 = 0.75 hour = 45 minutes. At 160 knots the airplane covers about 2.67 NM per minute. The relationship gives the leg time.

7. B — CG change equals (weight × distance) ÷ total weight: (60 × 50) ÷ 2,400 = 3,000 ÷ 2,400 = 1.25 inches. This is the standard weight-shift relationship. It gives the resulting CG movement.

8. C — Because the coded direction "77" exceeds 36, the special encoding applies: subtract 50 (77 − 50 = 27 → 270°) and add 100 to speed (99 + 100 = 199 knots). This signals winds over 100 knots. The result is 270° at 199 knots.

9. B — Endurance equals usable fuel divided by burn rate: 48 ÷ 12 = 4 hours. This is the basic endurance relationship. It determines how long the airplane can fly.

10. A — A runway heading of 273° rounds to 270°; dropping the last digit gives Runway 27. The designator is the magnetic heading rounded to the nearest 10 degrees. This is a standard chart-reading skill.

11. A — Interpolating at 3,000 feet (halfway between 2,000 and 4,000) gives the value halfway between 1,000 and 1,400: 1,200 feet. Interpolation finds values between listed chart entries. Careful interpolation avoids the distractor traps.

12. C — Time equals distance divided by groundspeed: 45 ÷ 135 = 0.333 hour = 20 minutes. At 135 knots the airplane covers 2.25 NM per minute. The relationship gives the leg time.

13. A — Fuel equals rate times time: 8.5 × 2 = 17 gallons. This is the basic fuel-burn relationship. It is straightforward multiplication.

14. B — Fuel weight equals gallons times pounds per gallon: 30 × 6 = 180 pounds. Avgas weighs about 6 pounds per gallon. This conversion is used in weight and balance.

15. A — Groundspeed equals true airspeed minus the headwind component: 120 − 25 = 95 knots. A tailwind would add. The headwind reduces groundspeed.

16. C — "2435+05" decodes to wind from 240° at 35 knots with a temperature of +5°C. The direction is read in tens of degrees. The decode gives 240° at 35 knots.

17. C — Stall speed increases with the square root of the load factor; at 2 Gs that is $\sqrt{2} \approx 1.41$, an increase of about 41%. The 60°/2G/41% relationship is a classic figure. Steeper banks raise stall speed sharply.

18. B — Groundspeed equals distance divided by time: 100 ÷ (40 ÷ 60) = 100 ÷ 0.667 = 150 knots. The relationship solves for speed. It is the inverse of the time computation.

19. B — Fuel equals burn rate times time, where time = 75 ÷ 150 = 0.5 hour, so 10 × 0.5 = 5 gallons. The leg takes 30 minutes at 150 knots. The fuel-burn relationship gives 5 gallons.

20. A — Standard temperature at 4,000 feet is 15°C minus 2°C per 1,000 feet over 4,000 feet: 15 − 8 = +7°C. The standard lapse rate is the basis. It is used to judge nonstandard deviations.

21. C — With the altimeter 0.50 in. Hg above standard, pressure altitude is 500 feet below the 2,000-foot field elevation: 1,500 feet. A setting above 29.92 lowers pressure altitude. The relationship is inverse to the setting.

22. A — Total moment equals the sum of each item's moment: (200 × 60) + (100 × 40) = 12,000 + 4,000 = 16,000 lb-in. Moments are additive. The total moment feeds the CG computation.

23. A — Distance equals groundspeed times time: 140 × 0.5 = 70 nautical miles. At 140 knots in 30 minutes the airplane covers 70 NM. The relationship gives distance.

24. B — The crosswind component equals wind speed times the sine of the angle: 20 × sin(60°) = 20 × 0.866 ≈ 17 knots. The 60° angle produces a larger crosswind than headwind. The crosswind is about 17 knots.

25. A — Groundspeed equals true airspeed plus the tailwind component: 105 + 18 = 123 knots. A headwind would subtract. The tailwind increases groundspeed.

26. C — Density altitude equals pressure altitude plus the temperature deviation times 120 feet: 4,000 + (25 − 7) × 120 = 4,000 + 2,160 = 6,160 feet. The 18°C above standard adds 2,160 feet. High temperature raises density altitude.

27. A — Weight to shift equals (CG change × total weight) ÷ distance: (2 × 2,000) ÷ 100 = 4,000 ÷ 100 = 40 pounds. This rearranges the weight-shift formula. Moving 40 pounds 100 inches shifts the CG 2 inches.

28. B — A runway heading of 355° rounds to 360°; dropping the last digit gives Runway 36 (not 00). The designator uses the rounded magnetic heading. Runway 36 corresponds to a north heading.

29. B — CG change equals (weight × distance) ÷ total weight: (80 × 30) ÷ 2,000 = 2,400 ÷ 2,000 = 1.2 inches. This is the standard weight-shift relationship. It gives the CG movement.

30. C — Time equals distance divided by groundspeed: 70 ÷ 140 = 0.5 hour = 30 minutes. At 140 knots the airplane covers 70 NM in 30 minutes. The relationship gives the time.

31. C — Interpolation finds the value halfway between the 2,000- and 4,000-foot entries for a value at 3,000 feet. Rounding or using the lower value introduces error. Interpolation is the required technique.

32. B — Total weight equals the sum of all items: 1,800 + 340 + 120 + 90 = 2,350 pounds. Weights are additive. The total is checked against maximum gross.

33. A — The headwind component equals true airspeed minus groundspeed: 110 − 90 = 20 knots. The difference reveals the headwind. It reduced groundspeed by 20 knots.

34. A — CG equals total moment divided by total weight: 98,100 ÷ 2,350 = 41.74 inches. This is the core weight-and-balance computation. The CG is then checked against the envelope.

35. C — The crosswind component equals wind speed times the sine of the angle: 28 × sin(45°) = 28 × 0.707 ≈ 19.8, about 20 knots. At 45°, crosswind and headwind components are equal. The crosswind is about 20 knots.

36. B — Time equals distance divided by groundspeed: 60 ÷ 120 = 0.5 hour = 30 minutes. At 120 knots the airplane covers 60 NM in 30 minutes. The relationship gives the diversion time.

37. C — A winds-aloft forecast omits temperature for altitudes within 2,500 feet of the station elevation. It also gives no wind below 1,500 feet AGL. Knowing the encoding rules prevents misreading.

38. A — Fuel weight equals gallons times pounds per gallon: 25 × 6 = 150 pounds. Avgas weighs about 6 pounds per gallon. This conversion is used in weight and balance.

39. A — At 120 knots groundspeed, the airplane travels 2 nautical miles per minute (120 ÷ 60). This mental shortcut supports quick navigation estimates. It is a handy rule.

40. B — Time equals distance divided by groundspeed: 150 ÷ 150 = 1 hour = 60 minutes. When distance equals groundspeed, the time is one hour. The relationship gives the time.

41. B — With an altimeter setting below standard (29.42 in. Hg), pressure altitude is higher than field elevation, because lower pressure corresponds to a higher pressure altitude. A setting above 29.92 lowers it. The relationship is inverse to the setting.

42. C — Moment equals weight times arm: 150 × 40 = 6,000 lb-in. The moment is the turning tendency about the datum. It feeds the CG computation.

43. C — Groundspeed equals true airspeed plus the tailwind component: 95 + 20 = 115 knots. A headwind would subtract. The tailwind increases groundspeed.

44. A — A density altitude much higher than field elevation increases takeoff distance, because the thinner air reduces lift and engine power. It does not decrease or leave the distance unaffected. High density altitude degrades takeoff performance.

45. B — A runway heading of 045° rounds to 040°; dropping the last digit gives Runway 4. The designator uses the rounded magnetic heading. Runway 4 corresponds to a northeast heading.

46. A — Time equals distance divided by groundspeed: 90 ÷ 135 = 0.667 hour = 40 minutes. At 135 knots the airplane covers 90 NM in 40 minutes. The relationship gives the time.

47. C — CG change equals (weight × distance) ÷ total weight: (100 × 20) ÷ 2,500 = 2,000 ÷ 2,500 = 0.8 inch. This is the standard weight-shift relationship. It gives the CG movement.

48. C — A coded "9900" indicates light and variable winds, less than 5 knots. It is a special code, not a literal direction and speed. Recognizing it prevents misreading.

49. B — A wind straight down the runway (0° off) gives a headwind component equal to the full wind: 15 knots, with no crosswind. The headwind component is the full 15 knots. A direct headwind has no crosswind.

50. B — Endurance equals usable fuel divided by burn rate: 60 ÷ 15 = 4 hours. This is the basic endurance relationship. It determines flight duration.

51. A — Distance equals groundspeed times time: 160 × 0.75 = 120 nautical miles. At 160 knots in 45 minutes the airplane covers 120 NM. The relationship gives distance.

52. C — Cloud base equals the spread divided by 2.5, multiplied by 1,000: (20 − 10) ÷ 2.5 × 1,000 = 4 × 1,000 = 4,000 feet AGL. The convective cloud base rises with the spread. This estimate aids planning.

53. A — A computed CG of 41.74 inches falls between the limits of 35.0 and 47.3 inches, so it is within the forward and aft limits. The loading is acceptable for CG. It must also be within weight limits.

54. B — Time equals distance divided by groundspeed: 80 ÷ 120 = 0.667 hour = 40 minutes. At 120 knots the airplane covers 80 NM in 40 minutes. The relationship gives the time.

55. B — Fuel equals the cruise burn plus the reserve: (8.5 × 2) + (8.5 × 0.75) = 17 + 6.375 ≈ 23.4 gallons. The 45-minute night reserve adds 0.75 hour of fuel. The total includes the required reserve.

56. C — "2440" decodes to wind from 240° at 40 knots. The direction is read in tens of degrees, and the speed is read directly (under 100 knots). The decode gives 240° at 40 knots.

57. A — Time to climb equals altitude gain divided by climb rate: 4,000 ÷ 500 = 8 minutes. The relationship gives the climb time. It is a simple division.

58. C — A tailwind component on landing increases the landing distance, because the airplane touches down at a higher groundspeed. A headwind decreases it. Tailwinds lengthen the landing roll.

59. B — One minute of latitude equals one nautical mile, the basis for measuring distance on the latitude scale. It does not equal a statute mile or kilometer. The latitude scale gives nautical-mile distances.

60. C — Fuel equals the leg fuel plus the reserve: (10 × 0.5) + (10 × 0.5) = 5 + 5 = 10 gallons. The 30-minute day reserve adds 0.5 hour of fuel. The total includes the required reserve.

61. A — When all items are at the same arm of 40 inches, the CG is also 40 inches, since the weighted average of identical arms is that arm. The CG cannot fall outside the common arm. This is a conceptual check on the computation.

62. A — Interpolating at 3,000 feet (halfway between 2,000 and 4,000) gives the value halfway between 1,000 and 1,400: 1,200 feet. Interpolation finds values between listed entries. The result is 1,200 feet.

63. B — The crosswind component equals wind speed times the sine of the angle: 28 × sin(45°) = 28 × 0.707 ≈ 19.8, about 20 knots. At 45° the crosswind and headwind components are equal. The crosswind is about 20 knots.

64. C — Groundspeed equals distance divided by time: 100 ÷ (40 ÷ 60) = 100 ÷ 0.667 = 150 knots. The relationship solves for speed. It is the inverse of the time computation.

65. B — With the altimeter 0.50 in. Hg above standard, pressure altitude is 500 feet below the 2,000-foot field elevation: 1,500 feet. A setting above 29.92 lowers pressure altitude. The relationship is inverse to the setting.

66. A — Moment equals weight times arm: 250 × 80 = 20,000 lb-in. The moment is the turning tendency about the datum. It feeds the CG computation.

67. B — Each 1°C above standard raises density altitude by about 120 feet. This rule of thumb lets a pilot sanity-check a density-altitude computation. Higher temperature raises density altitude.

68. C — Time equals distance divided by groundspeed: 90 ÷ 180 = 0.5 hour = 30 minutes. At 180 knots the airplane covers 90 NM in 30 minutes. The relationship gives the time.

69. B — CG change equals (weight × distance) ÷ total weight: (60 × 50) ÷ 2,400 = 3,000 ÷ 2,400 = 1.25 inches. This is the standard weight-shift relationship. It gives the CG movement.

70. A — Groundspeed equals true airspeed minus the headwind component: 110 − 25 = 85 knots. A tailwind would add. The headwind reduces groundspeed.

71. A — A runway heading of 180° gives Runway 18, dropping the last digit. The designator uses the magnetic heading rounded to the nearest 10 degrees. Runway 18 corresponds to a south heading.

72. C — Endurance equals usable fuel divided by burn rate: 48 ÷ 12 = 4 hours. This is the basic endurance relationship. It determines flight duration.

73. A — The crosswind component for a 15-knot wind at 90° equals the full wind: 15 × sin(90°) = 15 knots. A direct crosswind has no headwind component. The crosswind is the full 15 knots.

74. B — A total weight of 2,350 pounds is below the maximum gross of 2,550 pounds, so the weight is within limits. The airplane is not overweight, and the weight is determinable. It must also be within CG limits.

75. B — Fuel weight equals gallons times pounds per gallon: 20 × 6 = 120 pounds. Avgas weighs about 6 pounds per gallon. This conversion is used in weight and balance.

76. C — When a coded winds-aloft direction exceeds 36, subtract 50 from the direction and add 100 to the speed, signaling winds over 100 knots. The forecast is not in error, and the speed is not read directly. The rule decodes high-speed winds.

77. A — Distance equals groundspeed times time: 140 × 0.5 = 70 nautical miles. At 140 knots in 30 minutes the airplane covers 70 NM. The relationship gives distance.

78. C — CG change equals (weight × distance) ÷ total weight: (80 × 30) ÷ 2,000 = 2,400 ÷ 2,000 = 1.2 inches. This is the standard weight-shift relationship. It gives the CG movement.

79. B — Groundspeed equals true airspeed plus the tailwind component: 105 + 18 = 123 knots. A headwind would subtract. The tailwind increases groundspeed.

80. C — A runway heading of 045° rounds to 040°; dropping the last digit gives Runway 4. The designator uses the rounded magnetic heading. Runway 4 corresponds to a northeast heading.

81. A — Time equals distance divided by groundspeed: 45 ÷ 135 = 0.333 hour = 20 minutes. At 135 knots the airplane covers 45 NM in 20 minutes. The relationship gives the time.

82. A — Density altitude equals pressure altitude plus the deviation: 4,000 + 2,160 = 6,160 feet. The 2,160-foot increase reflects the hot-day temperature deviation. High temperature raises density altitude.

83. C — Fuel equals rate times time: 12 × 1.5 = 18 gallons. This is the basic fuel-burn relationship. It is straightforward multiplication.

84. B — A temperature of 12°C and dewpoint of 11°C is a 1°C spread, indicating air near saturation and favoring clouds or fog. A narrow spread does not indicate dry air or an inversion. The spread predicts cloud and fog formation.

85. C — Moment equals weight times arm: 150 × 40 = 6,000 lb-in. The moment is the turning tendency about the datum. It feeds the CG computation.

86. A — The headwind component equals wind speed times the cosine of the angle: 20 × cos(30°) = 20 × 0.866 ≈ 17 knots. The crosswind component would be 10 knots. The headwind is about 17 knots.

87. C — Time equals distance divided by groundspeed: 120 ÷ 160 = 0.75 hour = 45 minutes. At 160 knots the airplane covers 120 NM in 45 minutes. The relationship gives the time.

88. B — "2435" decodes to wind from 240° at 35 knots. The direction is read in tens of degrees, and the speed is read directly (under 100 knots). The decode gives 240° at 35 knots.

89. B — CG equals total moment divided by total weight: 98,100 ÷ 2,350 ≈ 41.7 inches. This is the core weight-and-balance computation. The CG is then checked against the envelope.

90. A — Time equals distance divided by groundspeed: 70 ÷ 140 = 0.5 hour = 30 minutes. At 140 knots the airplane covers 70 NM in 30 minutes. The relationship gives the time.

91. A — With an altimeter setting above 29.92 in. Hg, pressure altitude is lower than field elevation, because higher pressure corresponds to a lower pressure altitude. A setting below 29.92 raises it. The relationship is inverse to the setting.

92. B — The relationship (weight × distance) ÷ total weight yields the CG change resulting from the shift. It does not yield the total moment or the total weight. This formula gives the CG movement from relocating weight.

93. C — A runway heading of 355° rounds to 360°; dropping the last digit gives Runway 36 (north). The designator uses the rounded magnetic heading. Runway 36 corresponds to a north heading.

94. C — Groundspeed equals distance divided by time: 90 ÷ (30 ÷ 60) = 90 ÷ 0.5 = 180 knots. The relationship solves for speed. It is the inverse of the time computation.

95. A — The crosswind component equals wind speed times the sine of the angle: 20 × sin(60°) = 20 × 0.866 ≈ 17 knots. The 60° angle produces a larger crosswind than headwind. The crosswind is about 17 knots.

96. A — Moment equals weight times arm: 1,800 × 38 = 68,400 lb-in. The moment is the turning tendency about the datum. It is the empty-airplane contribution to the CG computation.

97. A — Two nautical miles per minute equals 120 knots (2 × 60). This relationship supports quick navigation estimates. It is a handy rule.

98. B — Fuel equals rate times time: 9 × (40 ÷ 60) = 9 × 0.667 = 6 gallons. The 40-minute leg burns 6 gallons. The fuel-burn relationship gives the answer.

99. C — Getting a value between the two listed entries confirms that interpolation was performed correctly. Rounding or selecting the lower value would not produce an in-between value. Interpolation yields a value between the known entries.

100. B — Time equals distance divided by groundspeed: 90 ÷ 135 = 0.667 hour = 40 minutes. At 135 knots the airplane covers 90 NM in 40 minutes. The relationship gives the time.

101. A — CG change equals (weight × distance) ÷ total weight: (100 × 20) ÷ 2,500 = 2,000 ÷ 2,500 = 0.8 inch. This is the standard weight-shift relationship. It gives the CG movement.

102. B — Fuel weight equals gallons times pounds per gallon: 30 × 6 = 180 pounds. Avgas weighs about 6 pounds per gallon. This conversion is used in weight and balance.

103. C — The ceiling is the lowest broken or overcast layer, so "BKN008" makes it 800 feet AGL. The OVC015 layer is higher. FEW and SCT layers are never ceilings.

104. C — Time to climb equals altitude gain divided by climb rate: 4,000 ÷ 500 = 8 minutes. The relationship gives the climb time. It is a simple division.

105. A — Distance equals groundspeed times time: 140 × 0.5 = 70 nautical miles. At 140 knots in 30 minutes the airplane covers 70 NM. The relationship gives distance.