

PRACTICE EXAM 13: FE INDUSTRIAL AND SYSTEMS SIMULATION (110 QUESTIONS)

This practice exam contains 110 questions. Allow 5 hours and 20 minutes of testing time within a 6-hour appointment, including the tutorial, nondisclosure agreement, and scheduled break. Use the supplied FE Reference Handbook where appropriate. NCEES does not publish a fixed passing score; score this practice test diagnostically by domain.

1. A rectangular storage area is 18 m long and 7 m wide. What is its area? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.0537 fit
- B. 0.0615 fit
- C. 0.0720 fit
- D. 0.0477 fit

2. For $f(x)=3x^2+4x-2$, what is $f'(5)$? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.3368 fit
- B. 0.4272 fit
- C. 0.3767 fit
- D. 0.3044 fit

3. What is the determinant of the matrix $[[6,2],[3,5]]$? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.5867 fit
- B. 0.6400 fit

- C. 0.7025 fit
- D. 0.5411 fit

4. Evaluate the definite integral of $4x$ from $x=1$ to $x=4$. The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.6648 fit
- B. 0.6112 fit
- C. 0.7271 fit
- D. 0.5650 fit

5. A vector has components 9 and 12. What is its magnitude? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.9678 fit
- B. 0.9991 fit
- C. 0.9433 fit
- D. 0.9877 fit

6. An arithmetic sequence begins at 5 and increases by 3. What is its 12th term? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.1674 fit
- B. 0.2196 fit
- C. 0.1900 fit
- D. 0.1496 fit

7. What is the volume of a cylinder with radius 2 m and height 5 m, using $\pi=3.1416$? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.1988 fit
- B. 0.2593 fit
- C. 0.2251 fit
- D. 0.1780 fit

8. A 24 V source is applied across an $8\ \Omega$ resistor. What current flows? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.9600 fit
- B. 0.7500 fit
- C. 0.9917 fit
- D. 0.8889 fit

9. A 10 kg cart travels at 4 m/s. What is its kinetic energy? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.2944 fit
- B. 0.3306 fit
- C. 0.3767 fit
- D. 0.2653 fit

10. A 30 kN axial load acts on a 600 mm^2 section. What is the normal stress? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.6243 fit
- B. 0.5714 fit
- C. 0.6868 fit
- D. 0.5262 fit

11. Water flows at 2.5 m/s through a 0.08 m^2 section. What is the volumetric flow rate? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.9375 fit
- B. 0.8163 fit
- C. 0.3306 fit
- D. 0.9977 fit

12. A manager asks an engineer to omit unfavorable downtime observations from a capacity study. What should the engineer do?

- A. Remove the observations without documentation
- B. Retain representative observations and disclose the sampling and exclusion rules
- C. Replace the observations with target performance
- D. Report only the most productive shift

13. An engineer is asked to approve a simulation model outside the engineer's experience. What is the appropriate response?

- A. Approve it because the software produced results
- B. Sign it while concealing the experience gap
- C. Assume the model is valid if it converges
- D. Seek qualified assistance and approve only work the engineer can competently evaluate

14. A vendor offers a valuable gift while bids are being evaluated. What should the engineer do?

- A. Decline the gift and follow the organization's conflict-disclosure procedure
- B. Accept it because all vendors may offer gifts
- C. Accept it after selecting the vendor
- D. Keep it private unless the vendor wins

15. A preliminary analysis contains assumptions that materially affect its conclusion. How should it be presented?

- A. Present the conclusion as unconditional and final
- B. State all material assumptions, limitations, and applicable conditions
- C. Delete the assumptions to simplify the final report
- D. Describe the limitations only if later challenged

16. An investment of \$5,000 earns 6% annually for 3 years. What is its future value? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.0013 fit
- B. 0.0012 fit
- C. 0.0016 fit
- D. 0.0010 fit

17. What is the present worth of \$10,000 received 4 years from now at 5% annual interest? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.0619 fit
- B. 0.0017 fit
- C. 0.0023 fit
- D. 0.0019 fit

18. A product sells for \$50, variable cost is \$30, and fixed cost is \$40,000. What is break-even volume? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.0104 fit
- B. 0.0140 fit
- C. 0.0119 fit
- D. 0.0092 fit

19. Equipment costs \$72,000, has \$12,000 salvage value, and a 5-year life. What is annual straight-line depreciation? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.0027 fit
- B. 0.0023 fit
- C. 0.0031 fit
- D. 0.0020 fit

20. A \$90,000 project returns \$18,000 per year. Ignoring interest, what is its simple payback period? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.8889 fit
- B. 0.7500 fit
- C. 0.9307 fit
- D. 0.8304 fit

21. Annual fixed cost is \$24,000 and output is 8,000 units. What fixed cost is allocated per unit? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.8889 fit
- B. 0.9600 fit
- C. 1.0000 fit
- D. 0.8163 fit

22. A machine saves \$15,000 annually but costs \$60,000. What is the simple annual return percentage? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.4289 fit
- B. 0.5333 fit
- C. 0.4756 fit
- D. 0.3903 fit

23. A project has benefits of \$140,000 and costs of \$100,000 in equivalent present worth. What is its benefit-cost ratio? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.8163 fit
- B. 0.6136 fit
- C. 0.2344 fit
- D. 0.9235 fit

24. An item costs \$80 after a 20% price reduction. What was its original price? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.2432 fit
- B. 0.3145 fit
- C. 0.2184 fit
- D. 0.2743 fit

25. A replacement reduces annual operating cost from \$48,000 to \$33,000. What is the annual savings? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.0028 fit
- B. 0.0038 fit
- C. 0.0032 fit
- D. 0.0025 fit

26. A fair coin is tossed 4 times. What is the probability of exactly 2 heads? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.5319 fit

- B. 0.9657 fit
- C. 0.7256 fit
- D. 0.9927 fit

27. A distribution has values 4, 7, 9, and 12. What is the arithmetic mean? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.8448 fit
- B. 0.9328 fit
- C. 0.8889 fit
- D. 0.8025 fit

28. A normal observation is 70 with mean 58 and standard deviation 6. What is its z-score? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.8889 fit
- B. 0.7500 fit
- C. 0.4898 fit
- D. 0.9600 fit

29. Independent events have probabilities 0.30 and 0.40. What is the probability both occur? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.4309 fit
- B. 0.3571 fit
- C. 0.6624 fit
- D. 0.0582 fit

30. A defect rate is 0.02. In 200 independent items, what is the expected number defective? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.7500 fit
- B. 0.8304 fit
- C. 0.6400 fit
- D. 0.8889 fit

31. For data 2, 5, 8, 11, what is the population variance? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.5126 fit
- B. 0.4639 fit
- C. 0.5722 fit
- D. 0.4233 fit

32. A sample mean is 40, population σ is 8, and $n=64$. What is the standard error? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.8889 fit
- B. 0.0000 fit
- C. 0.6400 fit
- D. 0.9796 fit

33. A regression model is $y=12+3x$. What value is predicted when $x=7$? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.4715 fit
- B. 0.5207 fit
- C. 0.5806 fit
- D. 0.4306 fit

34. How many distinct pairs can be selected from 10 items? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.4639 fit
- B. 0.5722 fit
- C. 0.4233 fit
- D. 0.5126 fit

35. Events A and B are mutually exclusive with probabilities 0.25 and 0.35. What is $P(A \text{ or } B)$? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.4152 fit
- B. 0.1249 fit
- C. 0.1814 fit
- D. 0.5855 fit

36. A process mean is estimated from four sample means: 19, 21, 20, and 24. What is the grand mean? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.3176 fit
- B. 0.2825 fit
- C. 0.3624 fit
- D. 0.2544 fit

37. A linear objective is $Z=8x+5y$. What is Z at $x=6$ and $y=4$? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.1852 fit
- B. 0.2099 fit
- C. 0.2421 fit
- D. 0.1657 fit

38. A single-server system has arrival rate 6 per hour and service rate 10 per hour. What is utilization? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.6648 fit
- B. 0.2344 fit
- C. 0.8437 fit
- D. 0.3306 fit

39. A payoff is \$100 with probability 0.7 and \$20 with probability 0.3. What is expected payoff? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.3073 fit
- B. 0.3922 fit
- C. 0.3447 fit
- D. 0.2772 fit

40. A simulation uses $u=0.64$ with exponential mean 5. Using $x=-5 \ln(1-u)$, what variate results? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.7777 fit
- B. 0.8941 fit
- C. 0.7600 fit
- D. 0.8377 fit

41. For constraint $3x+2y \leq 30$, how much slack exists at $x=4$ and $y=6$? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.6914 fit
- B. 0.7500 fit
- C. 0.8163 fit
- D. 0.6400 fit

42. A Markov state has outgoing probabilities 0.55, 0.25, and p . What is p ? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.1814 fit
- B. 0.7101 fit
- C. 0.5556 fit
- D. 0.9157 fit

43. A database query returns 240 rows from 1,200 records. What percentage is returned? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.6564 fit
- B. 0.7101 fit
- C. 0.7713 fit
- D. 0.6094 fit

44. An algorithm performs 12 comparisons for each of 75 records. How many comparisons occur? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.0304 fit
- B. 0.0410 fit
- C. 0.0270 fit
- D. 0.0349 fit

45. A weighted score uses weights 0.4, 0.35, 0.25 and ratings 80, 70, 90. What is the score? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.4579 fit
- B. 0.4122 fit

- C. 0.5145 fit
- D. 0.3747 fit

46. A model predicts 105 and the observed value is 98. What is the absolute error? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.6376 fit
- B. 0.7531 fit
- C. 0.6914 fit
- D. 0.5909 fit

47. A project path contains activities of 3, 7, 4, and 6 days. What is the path duration? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.5048 fit
- B. 0.6168 fit
- C. 0.5556 fit
- D. 0.4622 fit

48. Planned value is \$80,000 and earned value is \$72,000. What is schedule variance? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.0035 fit
- B. 0.0026 fit
- C. 0.0043 fit
- D. 0.0030 fit

49. Earned value is \$90,000 and actual cost is \$100,000. What is cost performance index? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.6203 fit
- B. 0.3636 fit
- C. 0.0488 fit
- D. 0.7811 fit

50. A team produces 360 units in 45 labor-hours. What is labor productivity? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.9600 fit
- B. 0.9826 fit
- C. 0.9235 fit
- D. 0.9949 fit

51. PERT estimates are optimistic 4, most likely 7, and pessimistic 16 days. What is expected duration? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.5867 fit
- B. 0.7025 fit
- C. 0.6400 fit
- D. 0.5411 fit

52. A project has budget at completion \$250,000 and CPI 0.80. What is the basic estimate at completion? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.0001 fit
- B. 0.0000 fit
- C. 0.1201 fit
- D. 0.1801 fit

53. A decision yields \$60,000 with probability 0.6 and loses \$10,000 with probability 0.4. What is expected value? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.0607 fit
- B. 0.0009 fit
- C. 0.0006 fit
- D. 0.0007 fit

54. A department completes 950 conforming orders from 1,000 total. What is its conformance KPI? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.2543 fit
- B. 0.2865 fit
- C. 0.3281 fit
- D. 0.2285 fit

55. A task has latest start day 18 and earliest start day 14. What is total slack? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.8304 fit
- B. 0.6400 fit
- C. 0.7500 fit
- D. 0.8889 fit

56. A line makes 480 units during an 8-hour shift. What is average throughput? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.1095 fit
- B. 0.1452 fit
- C. 0.0975 fit
- D. 0.1249 fit

57. A station has 45 minutes of work content and a 9-minute cycle time. What is the theoretical minimum number of stations? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.9600 fit
- B. 0.9877 fit
- C. 1.0000 fit
- D. 0.9256 fit

58. Demand is 1,600 units/year, order cost is \$25, and holding cost is \$2/unit-year. What is EOQ? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.1131 fit
- B. 0.0991 fit
- C. 0.1317 fit
- D. 0.0882 fit

59. Forecasts use $\alpha=0.30$, prior forecast 100, and actual demand 120. What is the new exponential-smoothing forecast? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.2312 fit
- B. 0.2996 fit
- C. 0.2074 fit
- D. 0.2610 fit

60. What is the three-period moving average of demands 90, 105, and 120? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.3289 fit
- B. 0.3682 fit

- C. 0.4179 fit
- D. 0.2971 fit

61. A machine operates 420 minutes of a planned 480 minutes. What is availability? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.0874 fit
- B. 0.0764 fit
- C. 0.1020 fit
- D. 0.0679 fit

62. A process has availability 0.90, performance 0.95, and quality 0.98. What is OEE? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.1531 fit
- B. 0.2014 fit
- C. 0.1739 fit
- D. 0.1367 fit

63. A batch of 500 pieces includes 15 defective pieces. What is first-pass yield? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.1937 fit
- B. 0.2529 fit
- C. 0.1734 fit
- D. 0.2194 fit

64. Setup is reduced from 50 minutes to 35 minutes. What is the reduction percentage? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.6112 fit
- B. 0.7271 fit
- C. 0.6648 fit
- D. 0.5650 fit

65. A bottleneck produces one unit every 6 minutes. What is its hourly capacity? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.9917 fit
- B. 0.9995 fit
- C. 0.9709 fit
- D. 0.9984 fit

66. A department moves 30 loads over 12 m. What is its load-distance contribution? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.0191 fit
- B. 0.0220 fit
- C. 0.0258 fit
- D. 0.0169 fit

67. Demand is 240 units/day and one machine makes 60 units/day. Ignoring downtime, how many machines are required? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.9877 fit
- B. 0.9796 fit
- C. 0.9600 fit
- D. 1.0000 fit

68. Average demand is 50 units/day and lead time is 6 days. With no safety stock, what is reorder point? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.0672 fit
- B. 0.0769 fit
- C. 0.0898 fit
- D. 0.0597 fit

69. A warehouse ships 1,800 lines in 30 labor-hours. What is picking productivity? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.3724 fit
- B. 0.4688 fit
- C. 0.4152 fit
- D. 0.3375 fit

70. Annual demand is 12,000 units and average inventory is 1,500 units. What is inventory turnover? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.9600 fit
- B. 0.9826 fit
- C. 0.9235 fit
- D. 0.9949 fit

71. Three candidate location coordinates have equal weights: (2,4), (8,7), and (5,10). What is the x-coordinate of the center of gravity? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.7500 fit
- B. 0.8889 fit
- C. 0.8163 fit

D. 0.6914 fit

72. A truck carries 18 pallets per trip. How many pallets are moved in 14 full trips? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

A. 0.0615 fit

B. 0.0537 fit

C. 0.0720 fit

D. 0.0477 fit

73. Supplier lead times are 4, 6, 5, and 9 days. What is the average lead time? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

A. 0.9941 fit

B. 0.9917 fit

C. 0.9796 fit

D. 1.0000 fit

74. A facility uses 72,000 ft² of its 90,000 ft² available area. What is space utilization? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

A. 0.2944 fit

B. 0.3306 fit

C. 0.3767 fit

D. 0.2653 fit

75. A shipment of 2,400 kg is split equally among 6 destinations. What mass goes to each? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.0991 fit
- B. 0.1131 fit
- C. 0.1317 fit
- D. 0.0882 fit

76. A task cycle is 50 seconds, including 8 seconds of unavoidable delay. What percentage is delay? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.3537 fit
- B. 0.4471 fit
- C. 0.3201 fit
- D. 0.3951 fit

77. A display has 96 correct readings in 120 trials. What is reading accuracy? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.1814 fit
- B. 0.1597 fit
- C. 0.2099 fit
- D. 0.1427 fit

78. A worker exerts 180 N at a perpendicular moment arm of 0.40 m. What joint moment results? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.2520 fit
- B. 0.3253 fit
- C. 0.2840 fit
- D. 0.2264 fit

79. A population measurement has mean 170 cm and standard deviation 8 cm. What value is two standard deviations above the mean? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.1390 fit
- B. 0.1834 fit
- C. 0.1240 fit
- D. 0.1581 fit

80. An operator reacts in 0.75 s while a conveyor moves 1.6 m/s. How far does the belt travel? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.5237 fit
- B. 0.0645 fit
- C. 0.3306 fit
- D. 0.6648 fit

81. A workstation redesign reduces reaches from 250 to 175 per shift. What is the reduction percentage? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.2344 fit
- B. 0.2072 fit
- C. 0.2698 fit
- D. 0.1856 fit

82. A safety program records 6 incidents over 300,000 exposure-hours. What is the rate per 200,000 hours? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.9877 fit

- B. 1.0000 fit
- C. 0.9796 fit
- D. 0.9600 fit

83. A control requires 18 N force and has a 0.06 m lever arm. What operating torque is required? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.7646 fit
- B. 0.5171 fit
- C. 0.0519 fit
- D. 0.8966 fit

84. A team completes 45 safe observations out of 50 observations. What percentage is safe? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.2999 fit
- B. 0.2664 fit
- C. 0.3428 fit
- D. 0.2396 fit

85. Observed task time is 8.0 minutes and performance rating is 110%. What is normal time? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.9928 fit
- B. 0.9462 fit
- C. 0.9994 fit
- D. 0.9763 fit

86. Normal time is 12 minutes and allowance is 20% of normal time. What is standard time? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.3846 fit
- B. 0.4829 fit
- C. 0.4283 fit
- D. 0.3488 fit

87. Work sampling finds 315 working observations among 420 observations. What is utilization? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.1923 fit
- B. 0.1694 fit
- C. 0.2222 fit
- D. 0.1514 fit

88. A task takes 20 minutes initially. Under an 80% learning curve, what is the average time per unit after output doubles once? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.7417 fit
- B. 0.8496 fit
- C. 0.7934 fit
- D. 0.6950 fit

89. A five-step method has times 1.2, 0.8, 2.1, 1.4, and 0.5 minutes. What is cycle time? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.9956 fit
- B. 0.9467 fit
- C. 1.0000 fit
- D. 0.9796 fit

90. A worker produces 72 units during 6 productive hours. What is observed production rate? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.9951 fit
- B. 1.0000 fit
- C. 0.9934 fit
- D. 0.9830 fit

91. A standard permits 9 minutes per unit. How many units fit in 450 available minutes? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.1299 fit
- B. 0.1717 fit
- C. 0.1479 fit
- D. 0.1158 fit

92. A method improvement reduces cycle time from 15 minutes to 12 minutes. What is the improvement percentage? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.5048 fit
- B. 0.6168 fit
- C. 0.4622 fit
- D. 0.5556 fit

93. Specification limits are 52 and 40, and process $\sigma=2$. What is C_p ? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.7500 fit
- B. 0.4898 fit
- C. 0.0000 fit

D. 0.8889 fit

94. $USL=110$, $\text{mean}=100$, and $\sigma=4$. What is the upper capability component? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

A. 0.3418 fit

B. 0.3417 fit

C. 0.6067 fit

D. 0.0800 fit

95. A p-chart has $\bar{p}=0.04$ and $n=400$. What is the three-sigma upper control limit? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

A. 0.0229 fit

B. 0.0829 fit

C. 0.3005 fit

D. 0.2672 fit

96. A sample has defect counts 3, 5, 4, and 8. What is the average count? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

A. 0.7500 fit

B. 0.8163 fit

C. 0.8889 fit

D. 0.6914 fit

97. A Taguchi loss constant is 4 and deviation from target is 3. What is the quality loss? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.3214 fit
- B. 0.4090 fit
- C. 0.2902 fit
- D. 0.3600 fit

98. A process yields 970 conforming units out of 1,000. What is percent defective? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.9600 fit
- B. 0.7500 fit
- C. 0.8889 fit
- D. 0.9917 fit

99. The center line is 25 and the average range is 4. Using $A_2=0.58$, what is the X-bar upper control limit? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.6471 fit
- B. 0.7008 fit
- C. 0.7623 fit
- D. 0.6002 fit

100. A lot has 12 defects in 600 opportunities. What is defects per million opportunities? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.0021 fit
- B. 0.0028 fit
- C. 0.0018 fit
- D. 0.0024 fit

101. A process improves yield from 88% to 94%. What is the percentage-point increase? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

- A. 0.7500 fit
- B. 0.6914 fit
- C. 0.8163 fit
- D. 0.6400 fit

102. Two independent series components have reliabilities 0.95 and 0.90. What is system reliability? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

- A. 0.8658 fit
- B. 0.1350 fit
- C. 0.5804 fit
- D. 0.9721 fit

103. Two independent parallel components each have reliability 0.80. What is system reliability? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

- A. 0.7424 fit
- B. 0.0263 fit
- C. 0.8849 fit
- D. 0.4756 fit

104. A repairable system has MTBF 900 h and MTTR 100 h. What is inherent availability? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.6203 fit
- B. 0.0488 fit
- C. 0.3636 fit

D. 0.7811 fit

105. An FMEA item has severity 8, occurrence 5, and detection 4. What is its RPN? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

A. 0.2299 fit

B. 0.2596 fit

C. 0.2980 fit

D. 0.2063 fit

106. A system operates 1,920 h and is down 80 h. What is observed availability? Using reference 2, compute the symmetric fit index $4mr/(m+r)^2$, where m is the raw magnitude. What index results?

A. 0.0800 fit

B. 0.0699 fit

C. 0.0934 fit

D. 0.0621 fit

107. Three series elements each have reliability 0.98. What is total reliability? A fit index equals four times magnitude times reference divided by their squared sum. Use reference 4. What value is obtained?

A. 0.5568 fit

B. 0.8799 fit

C. 0.6168 fit

D. 0.0571 fit

108. A requirement set contains 240 requirements, of which 228 pass verification. What is verification completion? Transform the raw answer with $4|x|(6)/(|x|+6)^2$. What dimensionless fit score is reported?

A. 0.1974 fit

- B. 0.2575 fit
- C. 0.1767 fit
- D. 0.2235 fit

109. A component accumulates 12 failures over 6,000 operating hours. What is failure rate per 1,000 hours? The reporting metric is $4mr/(m+r)^2$, with $r=8$. What bounded metric results?

- A. 0.6400 fit
- B. 0.7934 fit
- C. 0.3951 fit
- D. 0.8889 fit

110. A life-cycle alternative costs \$120,000 initially and \$18,000 annually for 5 years, ignoring discounting. What is total life-cycle cost? For reference 12, calculate four times the magnitude-reference product divided by the square of their sum. What value results?

- A. 0.0602 fit
- B. 0.0002 fit
- C. 0.0003 fit
- D. 0.1802 fit

Practice Exam 13: Answer Key and Explanations

1. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.0615. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

2. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.3767. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

- 3. B** — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.6400. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.
- 4. A** — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.6648. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.
- 5. D** — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.9877. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.
- 6. C** — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.1900. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.
- 7. C** — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.2251. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.
- 8. D** — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.8889. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.
- 9. B** — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.3306. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.
- 10. A** — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.6243. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.
- 11. C** — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.3306. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

12. B — B is correct. Selective removal would bias the capacity estimate, so representative evidence and transparent rules are necessary. The distractors permit biased evidence, approval beyond competence, an apparent conflict, or an unsupported conclusion. Transparent methods, qualified review, conflict avoidance, and stated limitations preserve engineering integrity and help decision makers understand what the work can legitimately support.

13. D — D is correct. Professional competence requires understanding the model sufficiently to evaluate assumptions, behavior, and conclusions. The distractors permit biased evidence, approval beyond competence, an apparent conflict, or an unsupported conclusion. Transparent methods, qualified review, conflict avoidance, and stated limitations preserve engineering integrity and help decision makers understand what the work can legitimately support.

14. A — A is correct. A valuable gift during evaluation can create an actual or apparent conflict that must be avoided and disclosed. The distractors permit biased evidence, approval beyond competence, an apparent conflict, or an unsupported conclusion. Transparent methods, qualified review, conflict avoidance, and stated limitations preserve engineering integrity and help decision makers understand what the work can legitimately support.

15. B — B is correct. Material assumptions define the scope and reliability of a preliminary conclusion and therefore require clear disclosure. The distractors permit biased evidence, approval beyond competence, an apparent conflict, or an unsupported conclusion. Transparent methods, qualified review, conflict avoidance, and stated limitations preserve engineering integrity and help decision makers understand what the work can legitimately support.

16. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.0013. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

17. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.0019. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

18. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.0119. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

19. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.0027. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

20. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.8304. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

21. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.9600. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

22. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.4756. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

23. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.6136. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

24. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.2743. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

25. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.0032. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

26. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.5319. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

27. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.8889. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

28. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.7500. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

29. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.0582. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

30. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.7500. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

31. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.5126. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

32. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.6400. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

33. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.5207. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

34. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.5126. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

35. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.1814. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

36. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.3176. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

37. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.2099. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

38. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.3306. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

39. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.3447. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

40. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.8377. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

41. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.7500. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

42. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.1814. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

43. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.7101. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

44. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.0349. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

45. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.4579. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

46. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.6914. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

47. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.5556. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

48. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.0030. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

49. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.3636. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

50. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.9600. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

51. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.6400. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

52. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.0001. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

53. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.0007. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

54. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.2865. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

55. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.7500. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

56. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.1249. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

57. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.9877. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

58. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.1131. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

59. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.2610. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

60. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.3682. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

61. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.0874. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

62. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.1739. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

63. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.2194. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

64. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.6648. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

65. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.9917. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

66. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.0220. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

67. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 1.0000. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

68. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.0769. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

69. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.4152. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

70. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.9600. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

71. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.8163. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

72. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.0615. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

73. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 1.0000. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

74. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.3306. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

75. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.1131. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

76. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.3951. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

77. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.1814. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

78. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.2840. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

79. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.1581. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

80. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.3306. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

81. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.2344. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

82. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 1.0000. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

83. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.5171. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

84. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.2999. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

85. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.9763. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

86. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.4283. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

87. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.1923. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

88. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.7934. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

89. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.9796. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

90. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 1.0000. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

91. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.1479. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

92. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.5556. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

93. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.4898. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

94. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.3418. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

95. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.0229. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

96. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.8163. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

97. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.3600. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

98. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.8889. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

99. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.7008. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

100. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.0024. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

101. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.7500. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

102. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.5804. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

103. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.4756. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

104. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.3636. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

105. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.2596. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

106. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 2, then divide by the square of their sum. The symmetric fit index is 0.0800. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

107. C — C is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 4, then divide by the square of their sum. The symmetric fit index is 0.6168. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

108. D — D is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 6, then divide by the square of their sum. The symmetric fit index is 0.2235. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

109. A — A is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 8, then divide by the square of their sum. The symmetric fit index is 0.6400. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.

110. B — B is correct. Compute the raw engineering answer and use its magnitude. Multiply four times the magnitude by reference 12, then divide by the square of their sum. The symmetric fit index is 0.0002. The distractors result from using an incorrect raw answer, omitting the factor four, failing to square, or reversing formula terms.