



# District • 2025



1-2. Consider a line that contains points  $A(-6, 4)$ ,  $B(2, 2)$  and  $C(e, -2)$ .  $\overrightarrow{BD} \perp \overrightarrow{AB}$ .

1.  $e =$  \_\_\_\_\_.

- (A) 14                      (B) 16                      (C) 18                      (D) 20                      (E) 22

2. The y-intercept of  $\overrightarrow{BD}$  is the point  $(0, b)$ .  $b =$  \_\_\_\_\_.

- (A)  $-6$                       (B)  $-5$                       (C)  $-4$                       (D)  $-3$                       (E)  $-2$

3. In Coach Hood's physics class, the test average counts 50% of the semester grade, the lab average counts 30% of the semester grade, and the semester exam counts 20% of the semester grade. Juan has a test average of 90 and a lab average of 94. An overall average of 90.0 or higher earns an A. What minimum score does Juan need to make on the semester exam to earn an A?

- (A) 78                      (B) 81                      (C) 84                      (D) 87                      (E) 90

4. The formula for the period of a pendulum is  $T = 2\pi\sqrt{\frac{L}{g}}$ , where  $T$  is the period in seconds,  $L$  is the length of the pendulum in meters, and  $g = 9.807 \text{ m/s}^2$ . If the period of a pendulum is 1.79 s, what is the length of the pendulum? (nearest centimeter)

- (A) 71 cm                      (B) 74 cm                      (C) 77 cm                      (D) 80 cm                      (E) 83 cm

5. A group of 428 track fans from Rankin traveled to Paris for the Olympics. They were able to purchase tickets for the night of the 400 m hurdles final. Ticket prices cost \$1063 for the best seats and \$741 for lesser seats. If the total cost of their tickets was \$364,160 how many of the best seats were purchased?

- (A) 144                      (B) 146                      (C) 148                      (D) 150                      (E) 152

6-7. Sha'Carri Richardson's swimming pool is shaped like a large rectangular prism with a length of 80 feet, a width of 60 feet and a constant depth of 4 feet 6 inches. The pool has two pipes. Pipe A can fill the pool by itself in 24 hours and pipe B can fill the pool by itself in 30 hours. The drain can empty the pool in 36 hours if the pipes are not in use.

6. When the pool is completely full, it holds \_\_\_\_\_ gallons of water. (nearest whole number)

- (A) 161,571                      (B) 161,575                      (C) 161,579                      (D) 161,583                      (E) 161,587

7. At  $t = 0$ , pipe A begins filling the pool. At  $t = 6$  hours, pipe B begins filling the pool. At  $t = 12$  hours, Noah Lyles opens the drain. The pool is finally completely full at  $t =$  \_\_\_\_\_ hours. (nearest tenth)

- (A) 18.4                      (B) 18.7                      (C) 19.0                      (D) 19.3                      (E) 19.6

8. On July 19, 2024, sixteen-year-old Quincy Wilson ran the 400 meters in 44.20 seconds at a meet in Florida. The average speed for his race was \_\_\_\_\_ mph. (nearest tenth)

- (A) 19.4                      (B) 19.6                      (C) 19.8                      (D) 20.0                      (E) 20.2

9. Anthony lives 3 miles from Seminole High School. He can run to school in 22 minutes or he can walk to school in 50 minutes. On Thursday, he left home and ran for 1.8 miles before tiring and walking the rest of the way. How long did it take him to get to school on Thursday? (nearest second)

(A) 32 min 36 sec (B) 32 min 48 sec (C) 33 min 0 sec (D) 33 min 12 sec (E) 33 min 24 sec

10. Rachel purchased a RAV4 plugin Hybrid for \$56,250 on October 3<sup>rd</sup>, 2022. The value of the car is depreciating at a rate of 16% per year. Find the predicted value of her RAV4 on October 3<sup>rd</sup>, 2028. (nearest dollar)

(A) \$19,761 (B) \$19,772 (C) \$19,783 (D) \$19,794 (E) \$19,805

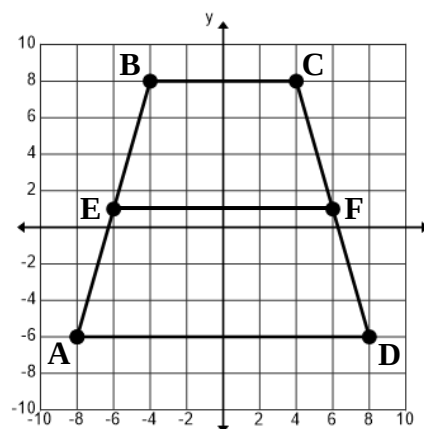
11.  $\overline{EF}$  is the median of trapezoid ABCD. Find the ratio of the area of trapezoid EBCF to the area of trapezoid AEFD. (nearest hundredth)

(A) 0.63 (B) 0.65 (C) 0.67  
(D) 0.69 (E) 0.71

12. Consider points G(12, -16) and H(15, b).

If  $\overrightarrow{GH}$  is parallel to  $\overrightarrow{AB}$ , then  $b =$  \_\_\_\_\_.

(A) -6.0 (B) -5.5 (C) -5.0  
(D) -4.5 (E) -4.0



Problems 11, 12

13. A pyramid has a square base, a height of 18, and a volume of 1227. The total surface area of the pyramid is \_\_\_\_\_. (nearest whole number)

(A) 758 (B) 761 (C) 764 (D) 767 (E) 770

14. Consider  $\triangle ABC$  with  $m\angle B = 90^\circ$ . Point D lies on  $\overline{AC}$  with  $\overline{AC} \perp \overline{BD}$ ,  $AD = 4.5$  and  $BD = 6$ . The perimeter of  $\triangle ABC =$  \_\_\_\_\_. (nearest tenth)

(A) 29.2 (B) 29.4 (C) 29.6 (D) 29.8 (E) 30.0

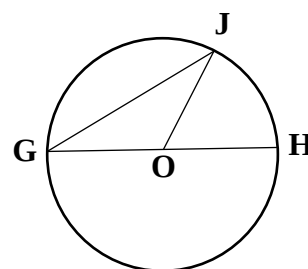
- 15-16. Consider the circle on the right with center O and diameter  $\overline{GH}$ .  $GH = 24$  and  $m\angle GOJ = 120^\circ$ .

15. The area of sector JOH is \_\_\_\_\_. (nearest tenth)

(A) 74.5 (B) 74.8 (C) 75.1 (D) 75.4 (E) 75.7

16. The area of the region between chord  $\overline{GJ}$  and minor arc GJ is \_\_\_\_\_. (nearest tenth)

(A) 87.2 (B) 87.5 (C) 87.8 (D) 88.1 (E) 88.4



Problems 15, 16

17. The volume of a right circular cone with a base diameter of 12 is 565.5. If a sphere has a surface area equal to the total area of the cone, what is the volume of the sphere? (nearest whole number)

- (A) 797                      (B) 800                      (C) 803                      (D) 806                      (E) 809

18-19.  $\triangle ABC$  is a right triangle with hypotenuse  $AC = 21.2$  and leg  $AB = 16$ .  $\triangle ABC \sim \triangle DEF$  and  $EF = 10$ . Point G lies on  $\overline{DF}$  and  $\overline{DF} \perp \overline{EG}$ .

18. Find the area of  $\triangle ABC$ . (nearest whole number)

- (A) 111                      (B) 114                      (C) 117                      (D) 120                      (E) 123

19. Find the perimeter of  $\triangle DEG$ . (nearest tenth)

- (A) 27.1                      (B) 27.4                      (C) 27.7                      (D) 28.0                      (E) 28.3

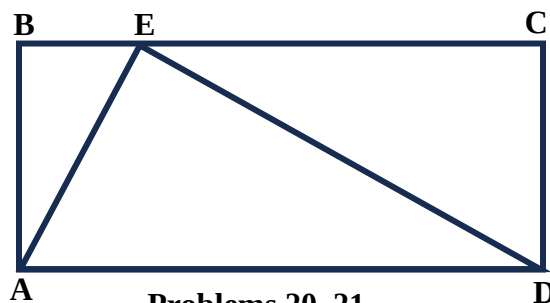
20. Consider rectangle  $ABCD$  and  $\triangle AED$ .

Point E lies on  $\overline{BC}$ .

$AB = 48$ ,  $BE = 14$ ,  $m\angle AED = 90^\circ$ .

Find the area of  $\triangle ECD$ . (nearest whole number)

- (A) 3941                      (B) 3944                      (C) 3947  
(D) 3950                      (E) 3953



Problems 20, 21

21. Let M be the midpoint of  $\overline{AD}$ . Draw auxiliary line segments  $\overline{EM}$  and  $\overline{CM}$ . Find the perimeter of  $\triangle EMC$ . (nearest whole number)

- (A) 343                      (B) 346                      (C) 349                      (D) 352                      (E) 355

22. The domain of  $f(x) = \frac{3x-6}{\frac{3}{2x-1} - \frac{3}{x-4}}$  is  $x \in \mathbb{R} \mid x \neq$  \_\_\_\_\_.

- (A) 2                      (B) 0.5, 2                      (C) 0.5, 2, 4                      (D) -3, 0.5, 4                      (E) -3, 0.5, 2, 4

23. Consider the sequence  $36, 30, 25, \frac{125}{6}, \frac{625}{36}, \dots$ . The sum of the first 12 terms is \_\_\_\_\_.  
(nearest hundredth)

- (A) 191.33                      (B) 191.44                      (C) 191.55                      (D) 191.66                      (E) 191.77

24. If  $f(x) = \frac{-3+2x}{3x-1}$  and  $h(x) = \frac{4x+5}{4-5x}$ , then  $(h^{-1} \circ f^{-1})(1) =$  \_\_\_\_\_.

- (A)  $\frac{3}{2}$                       (B)  $\frac{5}{3}$                       (C)  $\frac{11}{6}$                       (D) 2                      (E)  $\frac{13}{6}$

25. Angle A is in quadrant III and angle B is in quadrant IV. If  $\cos A = -\frac{8}{17}$  and  $\sin B = -\frac{5}{13}$ , then  $\tan(A - B) =$  \_\_\_\_\_.
- (A)  $\frac{72}{7}$                       (B)  $\frac{218}{21}$                       (C)  $\frac{220}{21}$                       (D)  $\frac{74}{7}$                       (E)  $\frac{32}{3}$
26. The sound level  $\beta$  in dB is given by  $\beta = 10 \log\left(\frac{I}{10^{-12}}\right)$ , where  $I$  = intensity in  $\text{W/m}^2$ . When a new muffler was installed on my car, the car's noise level dropped from 86 dB to 68 dB. Find the percent decrease in the intensity of sound emitted by my car. (nearest tenth)
- (A) 94.0 %                      (B) 95.1 %                      (C) 96.2 %                      (D) 97.3 %                      (E) 98.4 %
27. The vertices of a triangle are  $(-k, -12)$ ,  $(2, 8)$ , and  $(k, -4)$ . The area of the triangle is 88. If  $k > 0$ , then  $k =$  \_\_\_\_\_.
- (A) 2                              (B) 4                              (C) 6                              (D) 8                              (E) 10
28. Planet X has 36-hour days. In the month of Xenus, the temperature varies sinusoidally with a low of  $58^\circ\text{F}$  at  $t = 0$  hr and a high of  $82^\circ\text{F}$  at  $t = 18$  hr. On a typical Xenus day, the temperature is equal to or above  $62^\circ\text{F}$  for \_\_\_\_\_ hours. (nearest tenth)
- (A) 25.5                              (B) 25.8                              (C) 26.1                              (D) 26.4                              (E) 26.7
29. Points A, B, C, and D are the vertices of a square. Point E is in the interior of the square such that points A, B, and E form an equilateral triangle. A line segment connects points D and E. Another line segment connects points C and E. If the area of  $\triangle ABE$  is 43.3, then the area of  $\triangle CED$  is \_\_\_\_\_. (nearest tenth)
- (A) 6.7                              (B) 6.9                              (C) 7.1                              (D) 7.3                              (E) 7.5
30. Consider a regular nonagon with an area of 210. Find the area between the circumscribed circle and the inscribed circle of the nonagon. (nearest tenth)
- (A) 26.7                              (B) 27.0                              (C) 27.3                              (D) 27.6                              (E) 27.9
31. The center of an ellipse is the point  $(8, -6)$  and the ellipse is tangent to both axes. Find the eccentricity of the ellipse. (nearest hundredth)
- (A) 0.63                              (B) 0.66                              (C) 0.69                              (D) 0.72                              (E) 0.75
32. Consider the line  $10x + by + c = 0$  where every point on the line is the same distance from the point  $(-2, 6)$  as it is from the point  $(3, -8)$ .  $b - c =$  \_\_\_\_\_.
- (A) 4                                      (B) 5                                      (C) 6                                      (D) 7                                      (E) 8

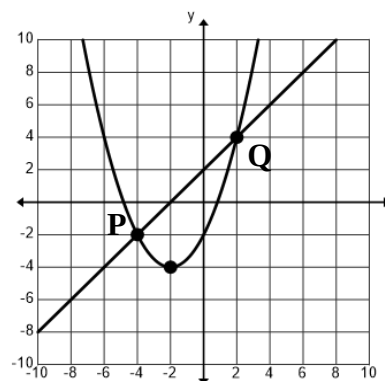
33. Suppose you could wrap a cable around the Earth between Seminole and Grand Saline. Seminole is located at  $32^{\circ} 40' \text{ N}$ ,  $102^{\circ} 39' \text{ W}$ . Grand Saline is located at  $32^{\circ} \text{ N } 40'$ ,  $95^{\circ} 42' \text{ W}$ . Assume the Earth is a sphere with a radius of 3960 miles. Find the length of this cable. (nearest whole number)
- (A) 395 mi      (B) 398 mi      (C) 401 mi      (D) 404 mi      (E) 407 mi
34. A shipment of 40 computers contains 25 with 16 GB RAM and 15 with 8 GB RAM. If 6 of the computers are randomly selected, what is the probability that exactly 4 of them will have 16 GB Ram? (nearest thousandth)
- (A) 0.340      (B) 0.343      (C) 0.346      (D) 0.349      (E) 0.352
35. A Navy jet leaves an aircraft carrier and flies due east at 600 mph. The carrier continues to travel  $45^{\circ}$  south of east at 25 mph. If the jet has enough fuel to fly for 8 hours, how far east can the jet travel before it must turn and return to the carrier? (Ignore the curvature of the earth) (nearest mile)
- (A) 2457 mi      (B) 2460 mi      (C) 2463 mi      (D) 2466 mi      (E) 2469 mi
36. The graph of the equation  $x^2 - 4xy + 2y^2 - 6x + 6y + 14 = 0$  is \_\_\_\_\_.
- (A) a parabola      (B) an ellipse      (C) a hyperbola      (D) a circle      (E) a line
37. A baseball hit from a point 2 feet above home plate cleared the 10-ft-tall center field wall by less than 4 inches. The parametric equations  $x(t) = (132 \cos(26^{\circ}))t$  and  $y(t) = 2 + (132 \sin(26^{\circ}))t - .5(32.174)t^2$  model the path of the ball. The distance from home plate to the center field wall could be \_\_\_\_\_.
- (A) 405 ft      (B) 407 ft      (C) 409 ft      (D) 411 ft      (E) 413 ft
38. Consider the graph of the polar equation  $r^2 \sin(2\theta) = 12$ . If point P lies on this graph and the rectangular coordinates of point P are  $(24, b)$ , then  $b =$  \_\_\_\_\_. (nearest thousandth)
- (A) 0.125      (B) 0.250      (C) 0.375      (D) 0.500      (E) 0.625
39. Consider a set of consecutive positive odd integers beginning with 1 and ending with  $n$ . If one of the integers is removed, the average of the remaining integers is  $37\frac{2}{3}$ . Which integer is removed?
- (A) 7      (B) 9      (C) 11      (D) 13      (E) 15

40. The focus of the parabola is the point  $F(-2, b)$ .  $b = \underline{\hspace{2cm}}$ .

- (A)  $-3.75$       (B)  $-3.50$       (C)  $-3.25$   
 (D)  $-3.00$       (E)  $-2.00$

41. Find the slope of the line tangent to the parabola at point Q. (nearest tenth)

- (A) 3.4      (B) 3.6      (C) 3.8  
 (D) 4.0      (E) 4.2



Problems 40, 41, 42

42. The area of the region bounded by the graphs of the parabola and line  $\overline{PQ}$  is  $\underline{\hspace{2cm}}$ . (nearest tenth)

- (A) 17.2      (B) 17.4      (C) 17.6      (D) 17.8      (E) 18.0

| t (day) | 1      | 18     | 32     | 44     | 60     |
|---------|--------|--------|--------|--------|--------|
| R(t)    | 0.0128 | 0.0545 | 0.0647 | 0.0704 | 0.0761 |

43. Water due to melting snow in the mountains entered the Palisades Reservoir at a rate  $R(t)$ .

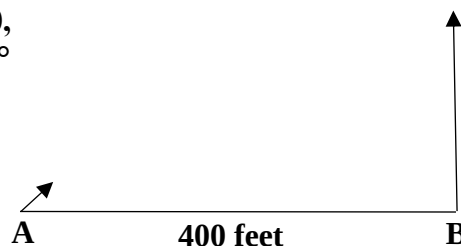
$R(t)$  is measured in millions of acre-feet per day and  $t$  is measured in days. Selected values of  $t$  and  $R(t)$  are given in the table above. Find the right Reimann sum using four rectangles (RRAM). The estimated amount of water that entered the Palisades Reservoir during this period was  $\underline{\hspace{2cm}}$  million acre-feet. (nearest hundredth)

- (A) 3.83      (B) 3.86      (C) 3.89      (D) 3.92      (E) 3.95

44. Consider the graph of  $x^2y^2 - 9x^2 - 4y^2 = 0$ . Find the equation of the line tangent to this graph at the point  $P(4, b)$ ,  $b < 0$ . The x-intercept of this tangent line is the point  $Q(d, 0)$ .  $d = \underline{\hspace{2cm}}$ . (nearest whole number)

- (A) 16      (B) 17      (C) 18      (D) 19      (E) 20

45. Consider the time interval  $0 \leq t \leq 5$  with  $t$  in seconds. At  $t = 0$ , a projectile is launched straight up from point B. Also at  $t = 0$ , a second projectile is launched from point A at an angle of  $45^\circ$  above the horizontal as shown. The distance from point A to point B is 400 feet. The projectiles travel in the same plane. The initial velocity of both projectiles is 120 ft/s. The closest approach of the projectiles during this time interval is  $\underline{\hspace{2cm}}$  feet. ( $g = 32.174 \text{ ft/s}^2$ ) (nearest foot)



Problem 45

- (A) 144      (B) 147      (C) 150  
 (D) 153      (E) 156

46. Consider the function  $h(x)$ , which is continuous on  $[0, 8]$ , and with  $h(3) = -4$  and  $h(5) = -4$ . If  $h''(x)$  is continuous and positive on  $[0, 8]$ , then which of the following must be true?

- (A)  $h'(4) = 0$       (B)  $h'(4) > 0$       (C)  $h'(4) < 0$       (D)  $h'(2) > 0$       (E)  $h'(2) < 0$

47. A particle is moving along the x-axis. At  $t = 0$ , the particle is located at  $x = 6$ . The acceleration of the particle is  $a(t) = -18t$ ,  $t \geq 0$ . If the maximum displacement of the particle in the positive direction is 54, find the velocity of the particle at  $t = 0$ . (nearest whole number)

- (A) 24                      (B) 30                      (C) 36                      (D) 42                      (E) 48

48-49. Given the differential equation  $\frac{dy}{dx} = 6x^2y$  with the initial condition  $y(0) = 3$ .

48. Use Euler's method with two steps of equal size to approximate the value of  $y(0.4)$ . (nearest hundredth)

- (A) 3.00                      (B) 3.07                      (C) 3.14                      (D) 3.21                      (E) 3.28

49. Solve the differential equation and find the value of  $y(0.4)$ . (nearest hundredth)

- (A) 3.29                      (B) 3.32                      (C) 3.35                      (D) 3.38                      (E) 3.41

50-51. Consider the first quadrant region R bounded by the y-axis and the graphs of  $y_1 = 3 + 2x^2$  and  $y_2 = 20$ .

50. The line  $x = k$  divides the region R into two equal areas.  $k = \underline{\hspace{1cm}}$ . (nearest hundredth)

- (A) 0.99                      (B) 1.01                      (C) 1.03                      (D) 1.05                      (E) 1.07

51. Find the volume by cross sections perpendicular to the x-axis of a solid if region R is the base of the solid and the cross sections are rectangles with a height that is twice the width. (nearest whole number)

- (A) 890                      (B) 893                      (C) 896                      (D) 899                      (E) 902

52. Find a geometric power series centered at 1 for  $f(x) = \frac{1}{4-x}$ . Determine the interval of convergence.

- (A) (0, 2)                      (B) (-1, 3)                      (C) (-2, 4)                      (D) (-3, 5)                      (E) (-4, 6)

53. Assume that the mean weight of adult male lions is approximately normally distributed with a mean of 430 pounds and a standard deviation of 35 pounds. Assume that the mean weight of adult female lions is approximately normally distributed with a mean of 340 pounds and a standard deviation of 25 pounds. An adult male that weighs \_\_\_\_\_ pounds has the same z-score as an adult female that weighs 380 pounds.

- (A) 486                      (B) 488                      (C) 490                      (D) 492                      (E) 494

| Test     | 1   | 2   | 3   | 4   | 5   | 6   |
|----------|-----|-----|-----|-----|-----|-----|
| Nicholas | 337 | 346 | 364 | 346 | 364 | 382 |
| Ross     | 328 | 337 | 364 | 355 | 373 | 382 |

54-56. Nicholas and Ross reached the finals of the Tournament of Champions Number Sense competition on Saturday. The final round consisted of six extremely difficult tests written by Anthony. The results are in the table above.

54. Find the interquartile range of Nicholas's scores.

- (A) 12                      (B) 14                      (C) 16                      (D) 18                      (E) 20

55. Find the positive difference of the median and mean of Ross's scores. (nearest tenth)

- (A) 3.0                      (B) 3.2                      (C) 3.4                      (D) 3.6                      (E) 3.8

56. Assume that all conditions for inference have been met and conduct an appropriate test to see if there is a significant difference in the mean scores of our two number sense masters. Find the p-value of this test. (nearest hundredth)

- (A) 0.88                      (B) 0.91                      (C) 0.94                      (D) 0.97                      (E) 1.00

57. The Teton Mountain Running Club have over 500,000 members in their database. They survey a random sample of size 2000 of their members to see if they prefer to run races in Idaho or in Wyoming. Survey results show that 1268 of the 2000 members surveyed prefer to run races in Idaho. Using a 96% level of confidence, they determine that the margin of error of their survey is \_\_\_\_\_%. (nearest tenth)

- (A) 1.8                      (B) 2.2                      (C) 2.6                      (D) 3.0                      (E) 3.4

| # Combos (X) | 6    | 12   | 18   | 24   | 30   |
|--------------|------|------|------|------|------|
| P(X)         | 0.25 | 0.35 | 0.20 | 0.15 | 0.05 |

58-59. Bob's Burgers of Knippa will deliver only if you purchase a multiple of six combo meals, not to exceed 30. The price of a combo meal is \$11.25. Let C = the charge for a particular order.

58. Find the expected value of C. (nearest dollar)

- (A) \$158                      (B) \$160                      (C) \$162                      (D) \$164                      (E) \$166

59. Find the standard deviation of C. (nearest penny)

- (A) \$76.12                      (B) \$78.14                      (C) \$80.16                      (D) \$82.18                      (E) \$84.20

60. In 2022, 422 of the 1044 finishers in the Funfest Marathon ran in energy return shoes. In 2024, 576 of the 1280 finishers in the Funfest Marathon ran in energy return shoes. Does the data provide convincing evidence that the proportion of runners who run in energy return shoes changed from 2022 to 2024? Dr. Stat performed an appropriate test and obtained a p-value of \_\_\_\_\_. (nearest ten-thousandth)

- (A) 0.0233                      (B) 0.0244                      (C) 0.0255                      (D) 0.0266                      (E) 0.0277

**DO NOT DISTRIBUTE BEFORE OR DURING THE CONTEST**

**University Interscholastic League  
MATHEMATICS CONTEST  
HS • District • 2025  
Answer Key**

|       |       |       |
|-------|-------|-------|
| 1. C  | 21. E | 41. D |
| 2. A  | 22. D | 42. E |
| 3. C  | 23. E | 43. C |
| 4. D  | 24. E | 44. A |
| 5. B  | 25. C | 45. D |
| 6. C  | 26. E | 46. E |
| 7. A  | 27. C | 47. C |
| 8. E  | 28. D | 48. C |
| 9. D  | 29. A | 49. E |
| 10. A | 30. A | 50. B |
| 11. E | 31. B | 51. D |
| 12. B | 32. B | 52. C |
| 13. A | 33. D | 53. A |
| 14. E | 34. C | 54. D |
| 15. D | 35. E | 55. A |
| 16. E | 36. C | 56. E |
| 17. C | 37. C | 57. B |
| 18. A | 38. B | 58. C |
| 19. C | 39. D | 59. B |
| 20. D | 40. B | 60. D |