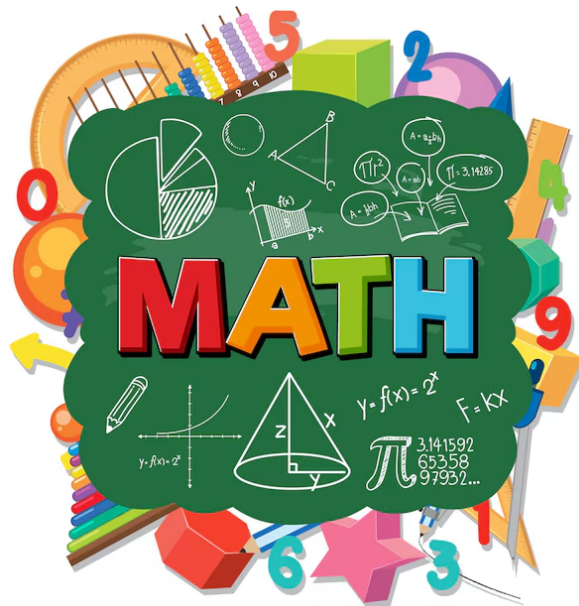




UNIVERSITY INTERSCHOLASTIC LEAGUE

Mathematics

Invitational A • 2025



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1-2. Lathin left Rankin High on his bicycle and headed west on Hwy 67 at 24 mph for 45 minutes. Next, He turned north and cycled at 30 mph for 40 minutes on Hwy 385. Then, he turned east on Hwy 329 and cycled at 32 mph for 15 minutes to the Cross Roads Steak House where he stopped for supper.

1. Lathin ordered an 8-oz filet for \$32.85, a side of broccoli for \$3.20, an iced tea for \$2.59, and a slice of apple pie for \$5.99. The tax rate is 8.25%. He paid for his meal with three \$20 bills. Since Kyina was the waitress, he told her to keep the change as a tip. How much was the tip?

- (A) \$11.25 (B) \$11.36 (C) \$11.47 (D) \$11.58 (E) \$11.69

2. What is the straight-line distance from the Cross Roads Steak House to Rankin High? (nearest tenth)

- (A) 21.8 mi (B) 22.1 mi (C) 22.4 mi (D) 22.7 mi (E) 23.0 ki

3. Rohan is taking Differential Equations from Mrs. Tan. There are six tests given, with test 6 counting twice. His first five test grades are 92, 88, 82, 91 and 93. If he needs a 90.0 or higher average to earn an A, what is the minimum grade he can make on test 6 and receive an A?

- (A) 92 (B) 93 (C) 94 (D) 95 (E) 96

4. The Pasadena UIL Math team did a fundraiser in the fall. The Quebe Sisters agreed to appear and perform Mr. Cantu's favorite song, Rose of San Antone. Adult tickets cost \$27.50 and student tickets cost \$15.50. They sold 934 tickets and raised \$21,053.00. How many adult tickets were sold?

- (A) 546 (B) 547 (C) 548 (D) 549 (E) 550

5. Nicholas has a jar full of nickels, dimes and quarters. He has a total of 141 coins with a total value of \$19.40 and he has 6 more quarters than nickels. How many dimes does he have?

- (A) 46 (B) 47 (C) 48 (D) 49 (E) 50

6. Two years ago, Rob was eight times as old as Janice. In six years, Rob will be four times as old as Janice. How old is Rob?

- (A) 46 (B) 48 (C) 50 (D) 52 (E) 54

7. Madison can mow and edge 3 lawns in 10 hours. Gabriela can mow and edge 2 lawns in 7 hours. If they work together, how long would it take them to mow and edge 8 lawns? (nearest minute)

- (A) 13 hr 35 min (B) 13 hr 40 min (C) 13 hr 45 min (D) 13 hr 50 min (E) 13 hr 55 min

8-9. A large cylindrical container has a diameter of 14 feet and a height of 18 feet.

8. Find the total area of the cylinder. (nearest whole number)

- (A) 1088 ft² (B) 1092 ft² (C) 1096 ft² (D) 1100 ft² (E) 1104 ft²

9. The cylindrical container stores _____ gallons of water when it is completely filled. (nearest whole number)

- (A) 20,716 (B) 20,720 (C) 20,724 (D) 20,728 (E) 20,732

10. Three times the measure of the complement of $\angle T$ is 16 greater than the supplement of $\angle T$.
 $m\angle T = \underline{\hspace{2cm}}$.

- (A) 36° (B) 37° (C) 38° (D) 39° (E) 40°

11. Find the perimeter of $\triangle ABC$. (nearest tenth)

- (A) 41.0 (B) 41.2 (C) 41.4
 (D) 41.6 (E) 41.8

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

- (A) 74 (B) 75 (C) 76
 (D) 77 (E) 78

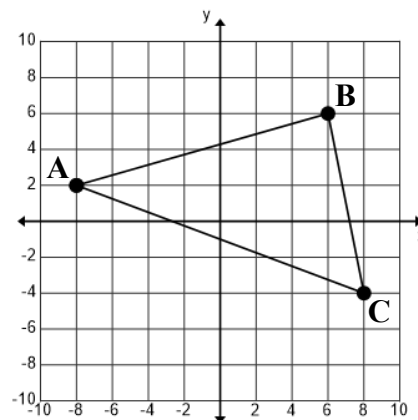
13. Point D is the midpoint of \overline{AC} . $BD = \underline{\hspace{2cm}}$.
 (nearest tenth)

- (A) 8.6 (B) 8.8 (C) 9.0
 (D) 9.2 (E) 9.4

14. $\triangle ABC$ is classified as a/an _____ triangle.

- (A) acute (B) right (C) obtuse (D) isosceles (E) equilateral

15-18. Consider a circle with center O. Chord \overline{AC} is parallel to chord \overline{DF} . Diameter \overline{BE} is perpendicular to chord \overline{DF} and $BE = 26$. \overline{AC} intersects \overline{BO} at point G and $BG = 8$. \overline{DF} intersects \overline{OE} at point H and $OH = 8$.



Problems 11, 12, 13, 14

15. The area of $\triangle OGC = \underline{\hspace{2cm}}$. (nearest tenth)

- (A) 29.6 (B) 29.8 (C) 30.0 (D) 30.2 (E) 30.4

16. $FD = \underline{\hspace{2cm}}$. (nearest tenth)

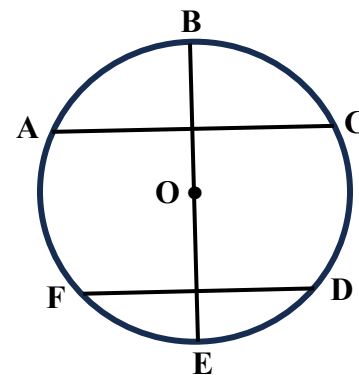
- (A) 19.7 (B) 19.9 (C) 20.1 (D) 20.3 (E) 20.5

17. $m\angle COD = \underline{\hspace{2cm}}^\circ$. (nearest tenth)

- (A) 60.0 (B) 60.3 (C) 60.6 (D) 60.9 (E) 61.2

18. The area of sector AOC is $\underline{\hspace{2cm}}$. (nearest whole number)

- (A) 193 (B) 195 (C) 197 (D) 199 (E) 201



19-20. Consider $\triangle DEF$ with $EF = 35$, $DF = 37$ and $m\angle DEF = 90^\circ$. Point G lies on \overline{DF} with $DG = 12$.

19. The area of $\triangle DEG =$ _____. (nearest whole number)

- (A) 68 (B) 70 (C) 72 (D) 74 (E) 76

20. The perimeter of $\triangle EGF =$ _____. (nearest whole number)

- (A) 68 (B) 70 (C) 72 (D) 74 (E) 76

21. Find the domain of $f(x) = \frac{\sqrt{3x-8}}{x-5}$.

- (A) $x \in \mathbb{R} \left| x \geq \frac{8}{3} \right.$ (B) $x \in \mathbb{R} \left| x \neq 5 \right.$ (C) $x \in \mathbb{R} \left| x > \frac{8}{3}, x \neq 5 \right.$
(D) $x \in \mathbb{R} \left| x \leq \frac{8}{3} \right.$ (E) $x \in \mathbb{R} \left| x \geq \frac{8}{3}, x \neq 5 \right.$

22. Consider the circle $x^2 + y^2 + 6x - 14y - 6 = 0$. The area of the circle is _____.
(nearest whole number)

- (A) 192 (B) 195 (C) 198 (D) 201 (E) 204

23. Consider the sequence 13, 20, 27, 34, 41, 48, ... Find the sum of the first 24 terms.

- (A) 2240 (B) 2242 (C) 2244 (D) 2246 (E) 2248

24. On July 4, 2020, Payton placed \$18,000 into an account that earns 5.76% annual interest compounded monthly. On July 4, 2021, Jacob placed \$18,000 into an account that earns 6.12% annual interest compounded quarterly. On July 4, 2030, Payton will have _____ more in his account than Jacob.

- (A) \$881.65 (B) \$882.70 (C) \$883.75 (D) \$883.80 (E) \$883.85

25. A hungry hawk is perched on the edge of the roof of the Tuscola State Bank. The hawk spots a tasty mouse on the ground. The angle of depression from the hawk to the mouse is 22° . The mouse begins moving toward the bank and when the mouse has moved 140 feet closer to the bank, the angle of depression is 37° . How tall is the bank? (nearest foot)

- (A) 118 ft (B) 120 ft (C) 122 ft (D) 124 ft (E) 126 ft

26. Consider the function $f(x) = x^4 + x^3 + cx^2 + 11x + 30$. If $f(1) = 24$, then $f(4) =$ _____.

- (A) 88 (B) 90 (C) 92 (D) 94 (E) 96

27. Find the shortest distance from the graph of $x^2 + y^2 = 25$ to the point $(8, -2)$.
(nearest tenth)

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

28. Consider the function $f(x) = 2 - 3\cos\left(\frac{5\pi x}{3} + \frac{\pi}{6}\right)$. The period of $f(x)$ is _____.

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

29. Given: $f(x) = 2x + 1$, $g(x) = 3\sqrt{x-5}$, $h(x) = (g \circ f)(x)$. Find the domain of $h(x)$.

- (A) $(-\infty, \infty)$ (B) $[5, \infty)$ (C) $\left[-\frac{1}{2}, 5\right]$ (D) $[2, \infty)$ (E) $(5, \infty)$

30. Point $A(-7\sqrt{6}, -7\sqrt{2})$ is rotated 150° counterclockwise about the origin to point $B(a, b)$.
 $a + b =$ _____. (nearest tenth)

- (A) 19.2 (B) 19.5 (C) 19.8 (D) 20.1 (E) 20.4

31-32. A regular hexagon has a perimeter of 72 cm^2 .

31. The area of the hexagon is _____ cm^2 . (nearest whole number)

- (A) 362 (B) 365 (C) 368 (D) 371 (E) 374

32. The area of a circle inscribed in the hexagon is _____ cm^2 . (nearest whole number)

- (A) 327 (B) 330 (C) 333 (D) 336 (E) 339

33. Find the shortest distance from the point $(9, 6)$ and the graph of the parametric equations
 $x = 4 - t$ and $y = 7 + t$. (nearest tenth)

- (A) 2.6 (B) 2.8 (C) 3.0 (D) 3.2 (E) 3.4

34. In his physics class, Anthony attached a long spring to the ceiling. He attached a 500-g mass to the bottom of the spring and waited for the spring to come to rest at its equilibrium position. Then he pulled the mass down 20 cm and released it at $t = 0$. The mass oscillated vertically between 20 cm below equilibrium and 20 cm above equilibrium. The position of the mass varied sinusoidally with time with a period of two seconds. How far above its equilibrium position was the mass at $t = 2.75 \text{ s}$?
(nearest centimeter)

- (A) 11 cm (B) 12 cm (C) 13 cm (D) 14 cm (E) 15 cm

35. If vector $\mathbf{u} = \langle 8, -6 \rangle$ is orthogonal to vector $\mathbf{v} = \langle -3, b \rangle$, then $b =$ _____.

- (A) -6 (B) -4 (C) -2 (D) 2.25 (E) 4.5

36. In Alexandra's favorite movie, Doc was playing 5-card poker using a standard 52-card deck. He was dealt 4 queens, which surprised the other players because the probability of being dealt 4 of a kind is _____. (not just 4 queens, but 4 of any kind) (nearest hundred-thousandth)

- (A) 0.00024 (B) 0.00036 (C) 0.00048 (D) 0.00060 (E) 0.00072

37-38 . Consider $\triangle ABC$ with vertices $A(2, -3, 5)$, $B(3, -2, -1)$ and $C(-5, 4, -3)$.

37. Find the perimeter of $\triangle ABC$. (nearest tenth)

- (A) 28.5 (B) 28.7 (C) 28.9 (D) 29.1 (E) 29.3

38. $m\angle ABC =$ _____°. (nearest whole number)

- (A) 97 (B) 99 (C) 101 (D) 103 (E) 105

39. Consider the sequence $\frac{2}{1}, \frac{3}{3}, \frac{5}{6}, \frac{7}{10}, \frac{11}{15}, \frac{13}{21}, \dots$ The sum of the 10th term and 11th term is _____.

- (A) $\frac{109}{110}$ (B) $\frac{164}{165}$ (C) $\frac{329}{330}$ (D) 1 (E) $\frac{331}{330}$

40. Find the shortest distance from the point $(-8, -4)$ and the graph of the polar equation

$$r = \frac{5}{4\cos\theta + 3\sin\theta} \text{ . (nearest tenth)}$$

- (A) 9.4 (B) 9.6 (C) 9.8 (D) 10.0 (E) 10.2

41. The y-intercept of the line tangent to the graph of $y = 4 - 2\tan(.25x)$ at $x = \frac{\pi}{6}$.

(nearest tenth)

- (A) 4.0 (B) 4.2 (C) 4.4 (D) 4.6 (E) 4.8

42. A 13-ft-long ladder is leaning against the wall of Haneli's house. The base of the ladder is being pulled away from the wall at 18 inches per second. Consider the triangle formed by the ground, the wall of the house and the ladder. The rate at which the area of the triangle is changing when the base of the ladder is 5 ft from the wall is _____ ft²/s. (nearest tenth)

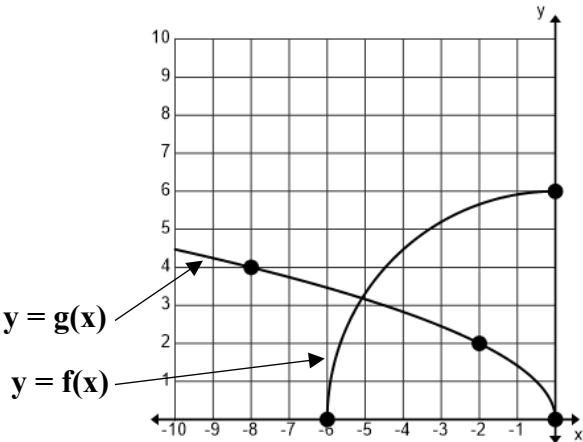
- (A) 7.2 (B) 7.4 (C) 7.6 (D) 7.8 (E) 8.0

43. At the instant the traffic light turned green, Carlos' car, which had been waiting at the intersection, began to accelerate at a constant rate of 7.2 ft/s^2 . At the same instant, Napoleon's car passed Carlos in the next lane, traveling at a constant speed of 30 mph. How fast will Carlos be going when he catches Napoleon? (nearest whole number)
- (A) 45 mph (B) 50 mph (C) 55 mph (D) 60 mph (E) 65 mph
44. Julian used the Trapezoidal Rule with four subintervals of equal width to approximate the value of $\int_0^{\pi} 2\sin(x)dx$. This value is _____ less than the exact value. (nearest thousandth)
- (A) 0.199 (B) 0.202 (C) 0.205 (D) 0.208 (E) 0.211
45. Given: $f(x) = -\frac{1}{2}x^3 - x - 1$. Find the value of $(f^{-1})'(x)$ when $x = 5$.
- (A) $-\frac{1}{7}$ (B) $-\frac{1}{6}$ (C) $-\frac{1}{5}$ (D) $-\frac{1}{4}$ (E) $-\frac{1}{3}$
46. Given: $2y\ln(x) + y^2 = 21$. Find $\frac{dy}{dx}$ when $y = 3$. (nearest hundredth)
- (A) -0.12 (B) -0.10 (C) -0.08 (D) -0.06 (E) -0.04
47. Consider the differential equation $\frac{dy}{dx} = 2x - 3y$ with the initial condition $y(0) = 2$. Use Euler's Method with three steps of equal size to approximate the value of $y(1.5)$. (nearest tenth)
- (A) 0.1 (B) 0.2 (C) 0.3 (D) 0.4 (E) 0.5
48. Mr. Cantu has a small herd of elk on his estate. One of the elk mommies gave birth to a calf that weighed 35 pounds. He named the calf Daniel. Daniel gains weight at the rate $\frac{dw}{dt} = k(900 - w)$ with w in pounds and t in years. Daniel weighed 511 pounds on his first birthday. Solve the differential equation and predict Daniel's weight on his fourth birthday. (nearest pound)
- (A) 855 pounds (B) 860 pounds (C) 865 pounds (D) 870 pounds (E) 875 pound
49. Find the fourth degree Maclaurin polynomial for $f(x) = e^{2x}$ and use it to approximate $f(0.5)$. The exact value of $f(0.5)$ is _____ greater than the approximation. (nearest hundred-thousandth)
- (A) 0.00993 (B) 0.00995 (C) 0.00997 (D) 0.00999 (E) 0.0101

50. Consider the curve defined by the parametric equations $x(\theta) = 2\cos(\theta)$, $y(\theta) = 2\sin(\theta)$. The x-intercept of the line tangent to the curve when $\theta = \frac{\pi}{6}$ is the point (a, b) . a = _____. (nearest tenth)

(A) 2.3 (B) 2.5 (C) 2.7 (D) 2.9 (E) 3.1

51-52. Consider the region bounded above by the graph of $y = f(x)$, which is part of a circle, below by the graph of $y = g(x)$, which is part of a parabola, and on the right by the y-axis.



51. Find the area of the bounded region. (nearest tenth)

(A) 14.7
(B) 14.9
(C) 15.1
(D) 15.3
(E) 15.5

52. Find the volume of the solid generated when the bounded region is revolved about the line $x = 4$. (nearest whole number)

(A) 567 (B) 570 (C) 573 (D) 576 (E) 579

Test #	1	2	3	4	5	6
Score	262	258	186	308	258	242

53-54. Raymundo took six number sense tests this week. His scores appear in the table above.

53. The difference between the median score and the mean score is _____. (nearest tenth)

(A) 4.9 (B) 5.1 (C) 5.3 (D) 5.5 (E) 5.7

54. A modified box plot showed that _____ of the test scores are outliers.

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

55. Assume that the Norwegian MuskoX has a mean weight of 628 pounds with a standard deviation of 42 pounds. Edgar owns a 702-pound muskoX. This weight places him at the _____ percentile.

(A) 88th (B) 90th (C) 92nd (D) 94th (E) 96th

56. Luka enjoys playing horse against Russell. They have played hundreds of times over the years and Luka wins 25% of the time. Luka watched Argyle play Grapevine last night and after the game he challenged Russell to 12 games of horse. Find the probability that Luka won at least 6 of the games. (nearest thousandth)

(A) 0.054 (B) 0.057 (C) 0.060 (D) 0.063 (E) 0.066

57. Consider the difference D of two independent random variables X and Y . $D = X - Y$.

Given that $\sigma_x = 5.20$ and $\sigma_y = 4.98$, what is σ_D , the standard deviation of D ?

- (A) 0.22 (B) 1.50 (C) 7.20 (D) 8.88 (E) 10.18

Week #	1	2	3	4	5	6
Minutes	45	55	60	70	75	90

58-59. Rachel is planning to enter the Ray Roberts 10-mile Trail Run in ten weeks. During the work week, she runs 3 miles every morning at 5:00 AM. She goes on a long run every Saturday morning. These long runs are on an unmarked trail, so she goes by time. The times of her first six long runs appear above. She calculated a LSRL to fit the data.

58. Find the value of the residual for the week 5 long run. (nearest tenth)

- (A) -3.5 (B) -3.3 (C) -3.1 (D) -2.9 (E) -2.7

59. Use the LSRL to predict the time of her last training run (week 9) before the race. (nearest minute)

- (A) 109 mi (B) 112 mi (C) 115 mi (D) 118 mi (E) 121 mi

60. Assume that a study by the Montana High School Association randomly selected 128 juniors and 112 seniors who participate in cross country to be part of a study. One of questions asked students if they plan to participate in cross country at the college level. Results of the study showed that 32 juniors and 22 seniors are planning to run cross country in college. An appropriate test was performed at the $\alpha = 0.05$ level to consider whether there is a significant difference in the responses of the juniors and the seniors to this question. The MHSA concluded, "Based on a p-value of _____, we fail to reject H_0 at the $\alpha = 0.05$ level. We conclude that there is insufficient evidence to conclude that the proportion of juniors who plan to run cross country at the college level differs from the proportion of seniors who plan to run cross country at the college level." (nearest hundredth)

- (A) 0.321 (B) 0.324 (C) 0.327 (D) 0.330 (E) 0.333

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**University Interscholastic League
MATHEMATICS CONTEST
HS • Invitational A • 2025
Answer Key**

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



Invitational B • 2025



1. Moses got a \$300 gift card from Academy Sports in O'Donnell. He bought some Nike shoes for \$165.57, some Adidas shorts for \$35.22, an Under Armor t-shirt for \$29.95, and some socks for \$12.95. The tax rate is 8.25%. How much is left on his gift card?
- (A) \$36.09 (B) \$36.13 (C) \$36.17 (D) \$36.21 (E) \$36.25
2. The total resistance R of three resistors connected in parallel is given by $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$. If $R = 48.65 \, \Omega$, $R_1 = 120 \, \Omega$ and $R_2 = 180 \, \Omega$, then $R_3 = \underline{\hspace{2cm}} \, \Omega$. (nearest whole number)
- (A) 90 (B) 120 (C) 150 (D) 180 (E) 210
3. Consider three consecutive odd numbers with a sum of 117. Find the product of these numbers.
- (A) 59,155 (B) 59,157 (C) 59,159 (D) 59,161 (E) 59,163
4. The number of cats in small West Texas towns varies directly as the number of mice and inversely as the number of dogs. If Sundown has 84 cats, 56 dogs and 265 mice, how many cats will Sudan have if they have 48 dogs and 419 mice?
- (A) 151 (B) 153 (C) 155 (D) 157 (E) 159
5. It is 108 miles from Childress to Canadian. Joan leaves Childress at 1:00 PM and begins running north on the highway toward Canadian at 11.2 mph. At 2:00 PM, Alberto leaves Canadian and begins running south on the same highway toward Childress at 12.2 mph. What time do they meet? (nearest minute)
- (A) 6:06 PM (B) 6:08 PM (C) 6:10 PM (D) 6:12 PM (E) 6:14 PM
6. Running at full speed, a boat can travel 105 miles downstream in 3.5 hours, but it requires 7.5 hours to travel 105 miles upstream. How fast can the boat travel in still waters running at full speed? (nearest whole number)
- (A) 19 mph (B) 20 mph (C) 21 mph (D) 22 mph (E) 23 mph
7. If $s(x)$ is the slant asymptote of the graph of $h(x) = \frac{2x^2 - 6x + 15}{x - 1}$, then $h(36) - s(36) = \underline{\hspace{2cm}}$. (nearest tenth)
- (A) 0.23 (B) 0.25 (C) 0.27 (D) 0.29 (E) 0.31
8. Addison is driving his 2025 Ford 150 Lightning pickup on Hwy 95 at a speed of 60 mph. Each of the tires has a radius of 17 inches. What is the rotational speed of the tires? (nearest whole number)
- (A) 587 rpm (B) 590 rpm (C) 593 rpm (D) 596 rpm (E) 599 rpm

9. The manager of Millersview Grocers took a three-week vacation. The first week he was gone, Joey raised the price of lemons by 22%. The next week, he raised the price of lemons by another 28%. The third week, he raised the price by another 19%. When the manager returned, he told Joey to lower the price to the pre-vacation price. By what percent did he have to decrease the price?
(nearest whole number)

- (A) 46% (B) 48% (C) 50% (D) 52% (E) 54%

10. Thomas has only pennies and dimes in a jar on his desk. The mass of 1000 pennies is 2.500 kg and the mass of 1000 dimes is 2.268 kg. The total value of the coins is \$131.00 and the total mass of the coins is 5.4716 kg. How many dimes does Thomas have?

- (A) 1190 (B) 1195 (C) 1200 (D) 1205 (E) 1210

11-15. Consider $\triangle ABC$ with vertices $A(-8, -2)$, $B(2, 6)$ and $C(8, -8)$. Point D lies on \overline{AC} such that ray \overrightarrow{BD} bisects $\angle ABC$. Point E is the midpoint of \overline{AB} .

11. Find the perimeter of $\triangle ECA$. (nearest tenth)

- (A) 38.1 (B) 38.4 (C) 38.7 (D) 39.0 (E) 39.3

12. $\triangle ECB$ is a/an _____ triangle.

- (A) equilateral (B) isosceles (C) right (D) acute (E) obtuse

13. $AD =$ _____. (nearest tenth)

- (A) 7.8 (B) 8.1 (C) 8.4 (D) 8.7 (E) 9.0

14. $BD =$ _____. (nearest tenth)

- (A) 10.9 (B) 11.1 (C) 11.3 (D) 11.5 (E) 11.7

15. The area of $\triangle BAD =$ _____. (nearest tenth)

- (A) 41.7 (B) 42.0 (C) 42.3 (D) 42.6 (E) 42.9

16. The volume of a cone with a diameter of 12.8 cm is 755 cm^3 . The total area of the cone is _____ cm^2 . (nearest whole number)

- (A) 496 (B) 499 (C) 502 (D) 505 (E) 508

17. Consider an equilateral triangle inscribed in a circle. If the area of the triangle is 73.18 cm^2 , then the area of the circle is _____ cm^2 . (nearest whole number)

- (A) 165 (B) 168 (C) 171 (D) 174 (E) 177

18. The area of a rectangle is 209.6 cm^2 . A diagonal of the rectangle is twice as long as the width.

The length of the rectangle is _____ cm. (nearest whole number)

- (A) 18 (B) 19 (C) 20 (D) 21 (E) 22

19-20. Point O is the center of a circle with a radius of 17 inches. Point O is 8 inches from chord \overline{AB} .

19. $AB =$ _____. (nearest tenth)

- (A) 29.8 (B) 30.0 (C) 30.2 (D) 30.4 (E) 30.6

20. The area of the region between minor arc AB and chord \overline{AB} equals _____.
(nearest whole number)

- (A) 176 (B) 180 (C) 184 (D) 188 (E) 192

21. Find the range of $f(x) = \sqrt{6 - x - x^2}$.

- (A) $(0, 2.5]$ (B) $[0, 2.5]$ (C) $[0, 2.5)$ (D) $(0, 2.5)$ (E) $(0, \infty)$

22. If $f(x) = 2x^2 + 3x - 5$ and $g(x) = x + 1$, then $(f \circ g)(2) =$ _____.

- (A) 18 (B) 19 (C) 20 (D) 21 (E) 22

23. The Knippa State Bank is the tallest building in town. A hungry hawk is perched on the edge of the roof. Sophia's bunny escaped from her back yard and was resting in the grass 318 feet from the base of the bank. If the angle of elevation from the bunny to the hawk is 37° , how tall is the bank?
(nearest whole number)

- (A) 234 ft (B) 237 ft (C) 240 ft (D) 243 ft (E) 246 ft

24. The seven members of the Grand Saline math team were seated in a circle around a large circular table along with their coach in math practice. If there were eight seats available, how many distinct seating arrangements were possible?

- (A) 24 (B) 120 (C) 720 (D) 5040 (E) 40320

25. A regular nonagon is inscribed in a circle. If the area of the circle is 107.425, what is the area of the nonagon? (nearest whole number)

- (A) 95 (B) 97 (C) 99 (D) 101 (E) 103

26. Consider a geometric sequence in which the 1st term is 8 and the 4th term is $-\frac{27}{8}$. Find the sum of the first 10 terms of the sequence. (nearest thousandth)

- (A) 4.299 (B) 4.302 (C) 4.307 (D) 4.310 (E) 4.314

27. Consider the graph of $f(x) = 5 + 3\csc\left(\frac{2\pi x}{3} - \frac{\pi}{6}\right)$. The phase shift is _____ to the right.

- (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{\pi}{6}$ (E) $\frac{\pi}{3}$

28. The Nazareth Swiftettes have advanced to 31 state tournaments and have won the state tournament 25 times. Coach Lombard had 2 posts, 6 wings and 4 guards on his 1984 team. If his starting lineup always consisted of one post, two wings and two guards, how many starting lineups were possible?

- (A) 48 (B) 86 (C) 180 (D) 8,240 (E) 34,560

29. Consider the circle $x^2 + y^2 + ax + by + c = 0$. The center of the circle is the point $(6, -2)$ and the diameter is 22. $a + b + c =$ _____.

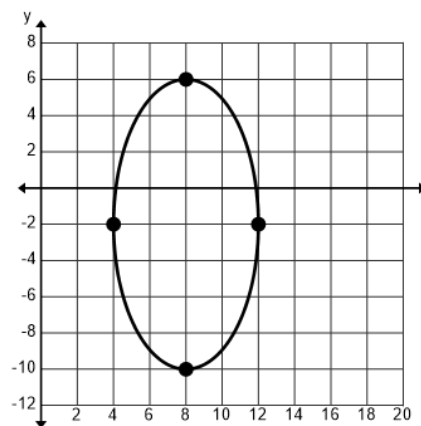
- (A) -89 (B) -87 (C) -85 (D) -83 (E) -81

30. Find the eccentricity of the ellipse.
(nearest thousandth)

- (A) 0.844
(B) 0.855
(C) 0.866
(D) 0.877
(E) 0.888

31. The parametric equations that produce the ellipse are $x(t) = a\cos(t) + b$ and $y(t) = c\sin(t) + d$, $-2\pi \leq t \leq 2\pi$.
 $a + b =$ _____.

- (A) -6 (B) -4 (C) 6
(D) 10 (E) 12



Problems 30, 31, 32

32. Find the distance from the center of the ellipse to the line $y = .25x + 12$. (nearest tenth)

- (A) 15.5 (B) 15.8 (C) 16.1 (D) 16.4 (E) 16.7

33. The graph of the polar equation $r = 2 + 4\cos\theta$ is a _____.

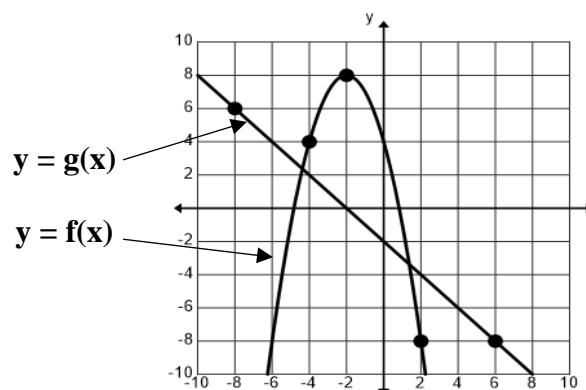
- (A) cardioid
(B) four petaled rose curve
(C) circle of radius 4
(D) limacon with an inner loop
(E) dimpled limacon

34. When you get into a Ferris Wheel car at the bottom of the ride, you are 2 feet off the ground. When the ride starts and the Ferris Wheel begins rotating, it takes 15 seconds to reach the highest point of the ride where you are 82 feet off the ground. Ivan gets into a car at the bottom and the Ferris Wheel rotates for 36 seconds and stops. How far above the ground is Ivan? (nearest inch)
- (A) 29 ft 8 in (B) 30 ft 1 in (C) 30 ft 6 in (D) 30 ft 11 in (E) 31 ft 4 in
- 35-36. Ship A leaves port at 12:00 PM and travels on a bearing of 90° at 24 mph. Ship B leaves port at 1:00 PM and travels on a bearing of 180° at 20 mph. Ship C leaves port at 2:00 PM and travels on a bearing of 270° at 16 mph.
35. How far apart are ship A and ship B at 6:00 PM? (nearest whole number)
- (A) 172 mi (B) 175 mi (C) 178 mi (D) 181 mi (E) 184 mi
36. At what time will ship A and ship C be 300 mi apart? (nearest minute)
- (A) 8:15 PM (B) 8:18 PM (C) 8:21 PM (D) 8:24 PM (E) 8:27 PM
37. A population of Giant Flying Joro Spiders was discovered on June 15th, 2022 on the Newberry Ranch near Seminole. Female Joro spiders are yellow with legs that can grow up to four inches long. The original population included 114 adult females. On June 15th, 2024, the population reached 998 adult females. Assume exponential growth and predict the population on June 15th, 2029.
- (A) 226,293 (B) 226,297 (C) 226,301 (D) 226,305 (E) 226,309
38. Find the acute angle between the line $2x - y = 4$ and the line $3x + 7y = 9$. (nearest tenth)
- (A) 83.3° (B) 84.4° (C) 85.5° (D) 86.6° (E) 87.7°
39. Amarillo Slim is playing 5 card poker with a well shuffled, standard 52-card deck. What is the probability that he will be dealt a full house? An example of a full house is 3 jacks and 2 queens. (nearest hundred-thousandth)
- (A) 0.00111 (B) 0.00122 (C) 0.00133 (D) 0.00144 (E) 0.00155

40-41. The graphs of $y = f(x)$ and $y = g(x)$ are shown on the right.

40. The focus of the graph of $y = f(x)$ is the point $(-2, b)$. $b =$ _____.

- (A) 6 (B) 7 (C) $\frac{15}{2}$
 (D) $\frac{31}{4}$ (E) $\frac{63}{8}$



Problems 40, 41

41. Find the slope of the line normal to the graph of $y = f(x)$ at the point $P(-4, 4)$.

- (A) $-\frac{5}{4}$ (B) -1 (C) $-\frac{3}{4}$ (D) $-\frac{1}{2}$ (E) $-\frac{1}{4}$

42. A spherical balloon is losing helium at a constant rate of $4\pi \text{ cm}^3$ per minute while maintaining its spherical shape. When the radius of the sphere is 20 cm, the surface area of the sphere is decreasing at a rate of _____ cm^2 per minute. (nearest hundredth)

- (A) 1.26 (B) 1.37 (C) 1.48 (D) 1.59 (E) 1.70

43. Find the dimensions of the rectangle with the largest area that can be inscribed in a semicircle of radius 8. The area of this rectangle is _____. (nearest whole number)

- (A) 64 (B) 66 (C) 68 (D) 70 (E) 72

44-45. Consider the graph of $f(x) = 0.0105x^3 - 0.2x + 3$.

44. Find the number c in the interval $(-4, 9)$ that satisfies the mean value theorem for $f(x)$. (nearest tenth)

- (A) 4.3 (B) 4.5 (C) 4.7 (D) 4.9 (E) 5.1

45. Find the average value of $f(x)$ over the interval $[-5, 10]$. (nearest tenth)

- (A) 4.1 (B) 4.3 (C) 4.5 (D) 4.7 (E) 4.9

46. Air pressure decreases continually with the height above sea level at a rate proportional to the pressure at that height. Desarae's barometer reads 101.3 kPa at sea level and 89.415 kPa at 1000 m. At what height above sea level will her barometer read exactly one-half the reading at sea level? (nearest whole number)

- (A) 5510 m (B) 5521 m (C) 5532 m (D) 5543 m (E) 5554 m

47-48. A particle is traveling along the x-axis. At $t = 0$, the position of the particle is at $x = 6$ cm. The velocity of the particle is given by $v(t) = t^3 - 8t^2 + 3t + 12$, $0 \leq t \leq 10$.

47. The position of the particle when the acceleration of the particle is 15 cm/s^2 to the right is at $x =$ _____ cm. (nearest negative integer)

- (A) -120 cm (B) -114 cm (C) -108 cm (D) -102 cm (E) -96 cm

48. Find the total distance traveled by the particle on the time interval $[0, 10]$. (nearest whole number)

- (A) 415 cm (B) 424 cm (C) 433 cm (D) 442 cm (E) 451 cm

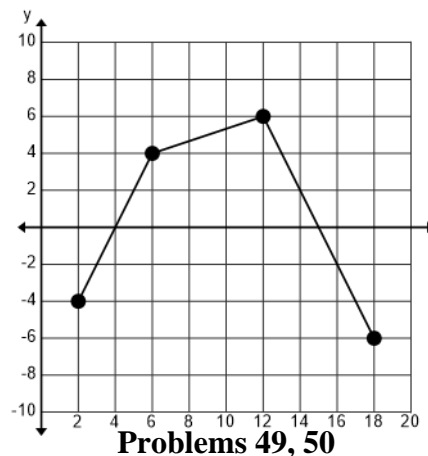
49-50. The graph of the piecewise function $h(x)$ is shown on the right.

49. $\int_2^{18} h(x) dx =$ _____. (nearest whole number)

- (A) 26 (B) 28
(C) 30 (D) 32
(E) 34

50. $\int_2^{18} h'(x) dx =$ _____. (nearest integer)

- (A) -2 (B) 0 (C) 2
(D) 4 (E) 6



51. The graph of $y = f(x)$ passes through the point $(1, 6)$ and satisfies the differential equation

$\frac{dy}{dx} = \frac{3x^2 - 2}{y}$. Solve the differential equation and find the value of b if the point $(2, b)$ lies on the graph of $y = f(x)$. (nearest tenth)

- (A) 6.6 (B) 6.8 (C) 7.0 (D) 7.2 (E) 7.4

52. Find the radius of convergence of $\sum_{n=0}^{\infty} \frac{(-1)^n x^{3n+1}}{(3n+1)!}$.

- (A) $\frac{1}{3}$ (B) 1 (C) 3 (D) 9 (E) ∞

53. Assume 60% of the boys at NCHS play a varsity sport and 50% of those obtain a college degree. Only 30% of the other boys obtain a college degree. Given that a randomly selected graduate of NCHS has a college degree, what is the probability that he played a varsity sport in high school? (nearest hundredth)

- (A) 0.65 (B) 0.67 (C) 0.69 (D) 0.71 (E) 0.73

Time (hr)	0	1	2	3.5	5.5	9
Score	120	144	158	200	238	324

54-55. Dominic recorded his mathematics test scores and the number of hours he practiced the week of each test. The results are in the table above. He plotted the data and decided there was a linear relationship between time spent practicing and the resulting test score on Saturday.

54. The regression equation predicts an increase of _____ points for each additional hour he practices. (nearest tenth)

- (A) 22.0 (B) 22.3 (C) 22.6 (D) 22.9 (E) 23.1

55. The residual for 3.5 hours of practice is _____. (nearest tenth)

- (A) 2.7 (B) 2.9 (C) 3.1 (D) 3.3 (E) 3.5

5-year	46	52	56	48	58	64	48	44
3-year	50	42	46	52	56	54	38	48

56-57. Ted claims that his 5-year batteries will last longer than his 3-year batteries. Eight batteries of each type are tested independently and the number of months each battery lasted is recorded.

56. If a 5-year battery costs \$425, find the average cost per month for a 5-year battery.

- (A) \$8.11 (B) \$8.14 (C) \$8.17 (D) \$8.20 (E) \$8.23

57. Assume the assumptions for inference have been met and conduct an appropriate test. The p-value of this test is _____. (nearest hundredth)

- (A) 0.05 (B) 0.07 (C) 0.09 (D) 0.11 (E) 0.13

Day	Sun	Mon	Tues	Wed	Thur	Fri	Sat
# C.E.	48	52	38	42	36	46	53

58-59. The number of patients who came to the emergency room at the Patton Springs Medical Center with cardiac events last year is shown in the table. Jet analyzed the data. He also performed a Chi-Square GOF Test with the following null hypothesis.

H_0 : ER visits at the Medical Center are evenly distributed across the days of the week.

58. The IQR of the data is _____. (nearest whole number)

- (A) 13 (B) 14 (C) 15 (D) 16 (E) 17

59. The Chi-Square statistic is _____. (nearest tenth)

- (A) 5.8 (B) 6.0 (C) 6.2 (D) 6.4 (E) 6.6

60. The Thursday cell contributed _____ to the Chi-Square statistic. (nearest tenth)

- (A) 1.4 (B) 1.6 (C) 1.8 (D) 2.0 (E) 2.2

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**University Interscholastic League
MATHEMATICS CONTEST
HS • Invitational B • 2025
Answer Key**

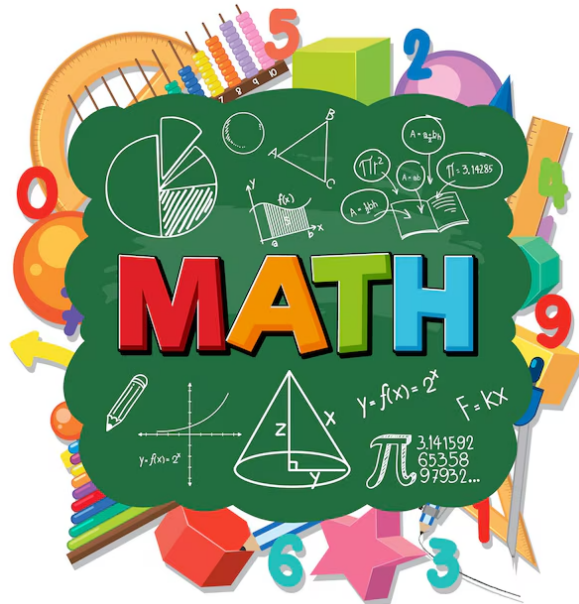
1. D	21. B	41. E
2. C	22. E	42. A
3. E	23. C	43. A
4. C	24. D	44. B
5. B	25. C	45. A
6. D	26. E	46. E
7. E	27. A	47. A
8. C	28. C	48. E
9. A	29. A	49. C
10. C	30. C	50. A
11. B	31. E	51. B
12. D	32. A	52. E
13. A	33. D	53. D
14. B	34. A	54. C
15. E	35. B	55. A
16. D	36. B	56. C
17. E	37. D	57. E
18.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



UNIVERSITY INTERSCHOLASTIC LEAGUE

Mathematics

District • 2025



DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!

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

1. $e =$ _____.

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

2. The y-intercept of \overline{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 3rd, 2022. The value of the car is depreciating at a rate of 16% per year. Find the predicted value of her RAV4 on October 3rd, 2028. (nearest dollar)

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

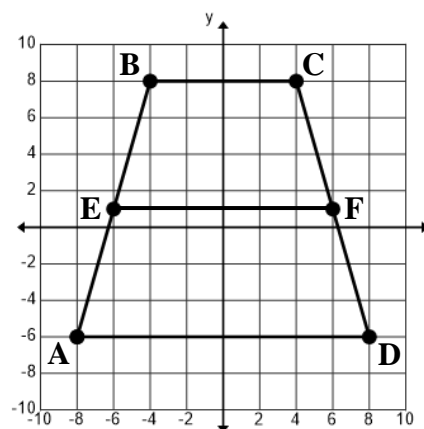
11. \overline{EF} is the median of trapezoid ABCD. Find the ratio of the area of trapezoid EBCF to the area of trapezoid AEFD. (nearest hundredth)

(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

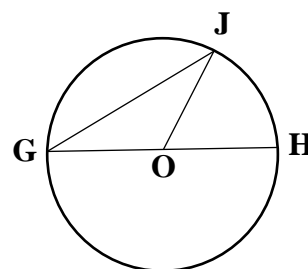
- 15-16. Consider the circle on the right with center O and diameter \overline{GH} . $GH = 24$ and $m\angle GOJ = 120^\circ$.

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

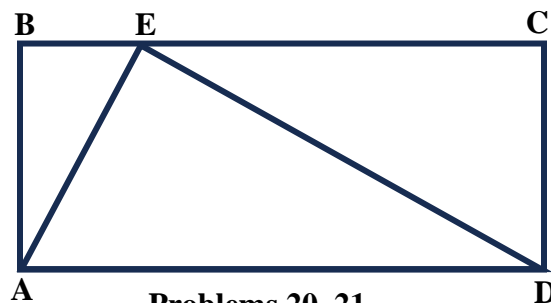
20. Consider rectangle $ABCD$ and $\triangle AED$.

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



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 β in dB is given by $\beta = 10 \log \left(\frac{I}{10^{-12}} \right)$, where I = intensity in 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°F at $t = 0$ hr and a high of 82°F at $t = 18$ hr. On a typical Xenus day, the temperature is equal to or above 62°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

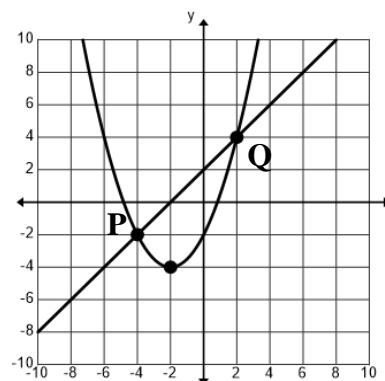
33. Suppose you could wrap a cable around the Earth between Seminole and Grand Saline. Seminole is located at $32^{\circ} 40' \text{ N}, 102^{\circ} 39' \text{ W}$. Grand Saline is located at $32^{\circ} \text{ N } 40', 95^{\circ} 42' \text{ W}$. Assume the Earth is a sphere with a radius of 3960 miles. 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° 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 $R(t)$.

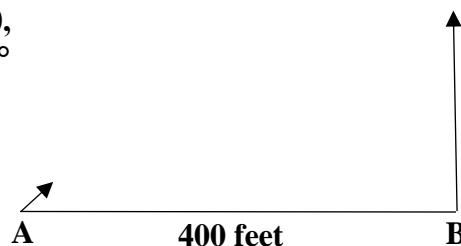
$R(t)$ is measured in millions of acre-feet per day and t is measured in days. Selected values of t and $R(t)$ are given in the table above. Find the right Reimann sum using four rectangles (RRAM). The estimated amount of water that entered the Palisades Reservoir during this period was $\underline{\hspace{2cm}}$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



Region • 2025



1. Joe, Arlene and Francis ate at The Outback on Thursday. Joe ordered the 8-oz filet for \$32.65. Arlene ordered a 6-oz sirloin for \$16.95 and Francis ordered salmon for \$24.35. All three ordered water, which is free. The tax rate was 8.25%. If they left a 25% after tax tip, the waiter received _____ as his tip.
- (A) \$19.68 (B) \$19.79 (C) \$19.90 (D) \$20.01 (E) \$20.12
2. The final velocity of an object is given by $v^2 = v_0^2 + 2a\Delta x$, where v = final velocity in m/s, v_0 = initial velocity in m/s, a = acceleration in m/s^2 , and Δx = change in position in m. If the initial velocity is 22 m/s, the change in position is 122 m, and the final velocity is 37.1 m/s, then the acceleration is _____ m/s^2 . (nearest hundredth)
- (A) 3.44 (B) 3.55 (C) 3.66 (D) 3.77 (E) 3.88
3. Mr. Chuang uses a weighted scale for the semester grade in his Organic Chemistry class. The test average counts as 50% of the semester grade, the lab average counts as 35%, and the final exam counts as 15%. If Luke has a 94 test average and a 96 lab average, what is the minimum score he needs to make on the final exam to have a semester grade of 95.0 or higher?
- (A) 93 (B) 94 (C) 95 (D) 96 (E) 97
4. The UIL Math Booster Club held a fundraiser to support the Flour Bluff math team. They flew in The Bangles to perform for the community. Adult tickets cost \$55 and student tickets cost \$40. If they sold 4526 tickets and raised \$219,500 how many adult tickets were sold?
- (A) 2556 (B) 2558 (C) 2560 (D) 2562 (E) 2564
5. Tim trimmed a large rectangular picture so that it would fit into a square frame. He trimmed 3 inches from the length and 6 inches from the width. The area of the trimmed picture is 144 square inches. What was the perimeter of the original picture before he trimmed it? (nearest inch)
- (A) 60 in (B) 62 in (C) 64 in (D) 66 in (E) 68 in
6. Jessica baked a batch of chocolate cookies. She gave one-ninth of them to Nathaniel. Next, she gave one-fourth of what remained to Samuel. Then she gave one-third of what remained to Kyle. Next, she gave 20 cookies to Mr. G. If she had 12 cookies left for herself, how many cookies did she give to Kyle?
- (A) 12 (B) 14 (C) 16 (D) 18 (E) 20
7. Des entered a long bicycle race on Saturday. She traveled at constant speed and finished at 2:00 PM. If she had traveled 5 mph faster, she would have finished at 1:00 PM. If she had traveled 5 mph slower, she would have finished at 3:30 PM. How long was the race? (nearest mile)
- (A) 120 mi (B) 130 mi (C) 140 mi (D) 150 mi (E) 160 mi
8. Tom and Jerry went to the hardware store to purchase numbers and letters for their mailboxes. Odd numbers cost 10 cents more than even numbers and letters cost 5 cents less than odd numbers. Tom's address is 89 PEACH and his cost was \$3.50. Jerry's address is 8647 WILLOW. What was Jerry's cost?
- (A) \$4.70 (B) \$4.75 (C) \$4.80 (D) \$4.85 (E) \$4.90

9. The length of the base of a triangle is one more than three times the height of the triangle. If the area of the triangle equals 222 cm^2 , then the height equals _____ cm.

- (A) 12 (B) 13 (C) 14 (D) 15 (E) 16

10. The fourth term of an arithmetic sequence is 21 and the fourteenth term is 51. Find the sum of the first 32 terms of the sequence.

- (A) 1872 (B) 1874 (C) 1876 (D) 1878 (E) 1880

11-13. Points E, F, G and H are midpoints.

11. Find the area of quadrilateral HEFG.

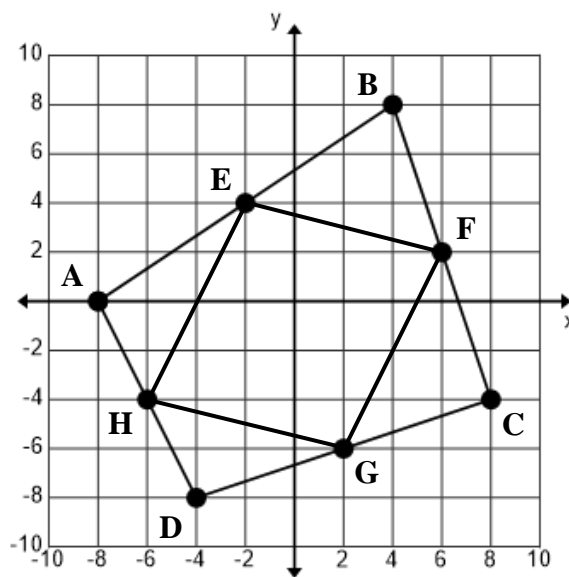
- (A) 70 (B) 72 (C) 74
(D) 76 (E) 78

12. $m\angle EHG =$ _____. (nearest tenth)

- (A) 76.3° (B) 76.6° (C) 76.9°
(D) 77.2° (E) 77.5°

13. If the point $P(a, b)$ is the centroid of $\triangle EBF$, then $a + b =$ _____. (nearest tenth)

- (A) 6.7 (B) 7.0 (C) 7.3
(D) 7.7 (E) 8.0



Problems 11, 12, 13

14. Circle O has a diameter of 38. If $\triangle PQR$ is an equilateral triangle with the same area as circle O, then the perimeter of $\triangle PQR =$ _____. (nearest whole number)

- (A) 151 (B) 154 (C) 157 (D) 160 (E) 163

15. The price of all supreme pizzas at Red Raider Pizza is 8.5 cents per square inch. An extra-large pizza has a diameter of 18 inches. A large pizza has a diameter of 15 inches. A medium pizza has a diameter of 12 inches. If Argyle's STEM team orders one extra-large supreme pizza, two large supreme pizzas, and three medium supreme pizzas, what is the before tax cost of Argyle's meal?

- (A) \$79.40 (B) \$80.51 (C) \$81.62 (D) \$82.73 (E) \$83.84

16. Consider a cube with a circumscribed sphere. If the surface area of the sphere is 697 cm^2 , then the total surface area of the cube = _____ cm^2 . (nearest whole number)

- (A) 438 (B) 441 (C) 444 (D) 447 (E) 450

17. Find the domain of $f(x) = \sqrt{20 - x - x^2}$.

- (A) $[-4, 5]$ (B) $(-4, 5)$ (C) $(-5, 4)$ (D) $[-5, 5]$ (E) $[-5, 4]$

18. The line $7x + 10y = 24$ and the parabola $x^2 + y - 4x = 0$ intersect at points A and B.

$AB = \underline{\hspace{2cm}}$. (nearest tenth)

- (A) 3.7 (B) 3.9 (C) 4.1 (D) 4.3 (E) 4.5

19-20. Given: $AB = 12$, $DC = 18$, $m\angle BCA = 30^\circ$,

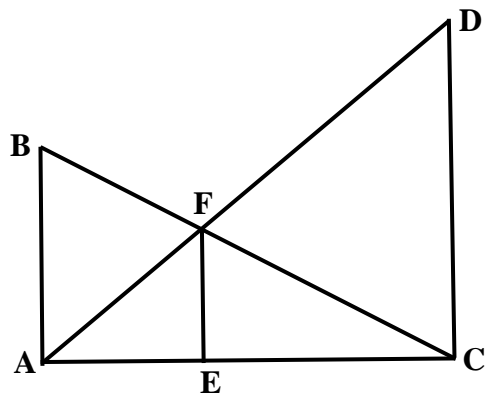
$\overline{BA} \perp \overline{AC}$, $\overline{FE} \perp \overline{AC}$, $\overline{DC} \perp \overline{AC}$.

19. $FE = \underline{\hspace{2cm}}$. (nearest tenth)

- (A) 7.0 (B) 7.2 (C) 7.4
(D) 7.6 (E) 7.8

20. $AE = \underline{\hspace{2cm}}$. (nearest tenth)

- (A) 7.7 (B) 7.9 (C) 8.1
(D) 8.3 (E) 8.5



Problems 19, 20

21. Sri's backyard pool is shaped like a right rectangular prism with a length of 36 feet, a width of 24 feet, and a constant depth D. The pipe filling the pool delivers 45 gallons of water per minute. If it takes 11.2 hours to completely fill the pool, what is the value of D? (nearest inch)

- (A) 4 ft 2 in (B) 4 ft 4 in (C) 4 ft 6 in (D) 4 ft 8 in (E) 4 ft 10 in

22. Grandpa placed X dollars into an account controlled by his financial advisor. The value of his account increased by 15% the first year. The value of his account increased by 12% the second year. The value of his account decreased by P% the third year. If the average annual increase in the value of his account for these three years was 6.96%, what is the value of P? (nearest whole number)

- (A) 4% (B) 5% (C) 6% (D) 7% (E) 8%

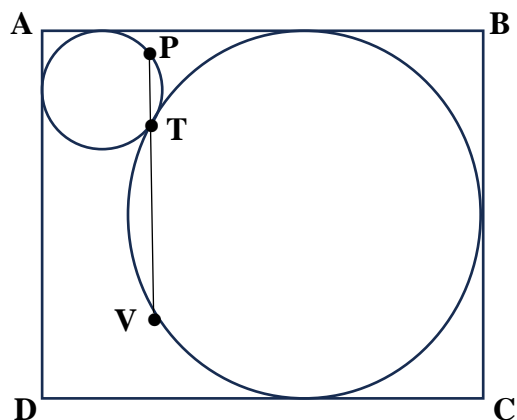
23. Young Sheldon has 4 red marbles, 6 green marbles, and B blue marbles. They are identical except for the color. If there are 19,399,380 distinguishable ways he can arrange them in a row, what is the value of B?

- (A) 7 (B) 8 (C) 9 (D) 10 (E) 11

24. Given: rectangle ABCD, $AD = 26.4$, $PV = 19.8$.

\overline{PV} is parallel to \overline{BC} . The circles are tangent to the sides of the rectangle and to each other. Point T lies on \overline{PV} and is a point of tangency. Draw auxiliary line segment \overline{DB} . $DB = \underline{\hspace{2cm}}$. (nearest tenth)

- (A) 39.5 (B) 39.7 (C) 39.9
(D) 40.1 (E) 40.3



Problem 24

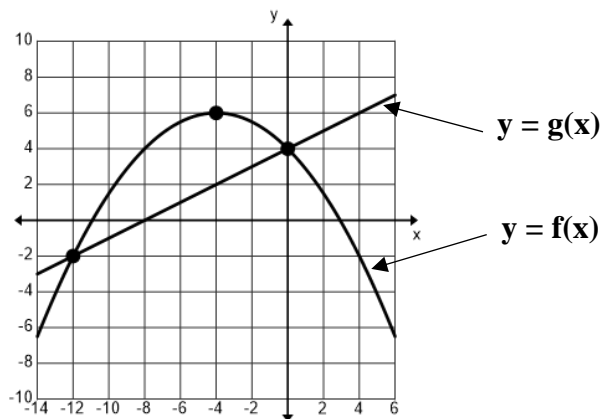
25. Mr. Garcia ordered a pair of blank dice. He wrote the numbers 1, 2, 3, 4, 5, and 7 on each die such that each face had only one number on it. He rolled the dice and added the two top faces. What are the odds that the sum was a prime number?
- (A) 5 to 18 (B) 11 to 25 (C) 1 to 2 (D) 13 to 23 (E) 7 to 11
26. Timothy climbs a ladder in his driveway and drops a golf ball from a height of 10 feet. It rebounds to a height equal to 60% of the distance it fell. This pattern continues until it eventually comes to rest. How far has the ball traveled when it hits the driveway for the fifth time? (nearest inch)
- (A) 36 ft 1 in (B) 36 ft 4 in (C) 36 ft 7 in (D) 36 ft 10 in (E) 37 ft 1 in
27. If $\cos \theta = -\frac{5}{13}$ and θ is in quadrant II, and if $\tan \alpha = -\frac{24}{7}$ and α is in quadrant IV, then what is the value of $\sin(\theta + \alpha)$?
- (A) $\frac{8}{13}$ (B) $\frac{202}{325}$ (C) $\frac{204}{325}$ (D) $\frac{206}{325}$ (E) $\frac{16}{25}$
- 28-29. Consider regular octagon ABCDEFGH with area = 1145.
28. The area of the circle inscribed in the octagon = _____. (nearest whole number)
- (A) 1074 (B) 1077 (C) 1080 (D) 1083 (E) 1086
29. The area of quadrilateral ABCH is _____. (nearest whole number)
- (A) 284 (B) 286 (C) 288 (D) 290 (E) 292
30. Consider an ellipse centered at C(10, 6) with foci at F(4, 6) and G(16, 6). The point B(10, 10) lies on the ellipse. The eccentricity of the ellipse = _____. (nearest hundredth)
- (A) 0.77 (B) 0.79 (C) 0.81 (D) 0.83 (E) 0.85
31. Consider a hyperbola centered at C(-6, -3) and with a vertex at V(-6, -7). Point R(6, 7.4) lies on the hyperbola. The point F(-6, d), $d > 0$ is a focal point of the hyperbola. $d =$ _____. (nearest tenth)
- (A) 2.6 (B) 2.8 (C) 3.0 (D) 3.2 (E) 3.4
32. The East Texas STEM Academy lured Mr. Taylor away from SHS by offering an annual salary of \$225,000 and the opportunity to teach Cal III, Linear Algebra and Differential Equations. Of the 456 seniors at STEM, 142 of them signed up for Cal III, 148 signed up for Linear Algebra, and 156 signed up for Differential Equations. Thirty-two seniors signed up for Cal III and Linear Algebra, but not Differential Equations. Forty seniors signed up for Linear Algebra and Differential Equations, but not Cal III. Twenty-four seniors signed up for all three courses. Fifty-six seniors only signed up for Differential Equations. How many seniors did not sign up for any of these three courses?
- (A) 164 (B) 166 (C) 168 (D) 170 (E) 172

33. Circle $x^2 + y^2 = 36$ is tangent to circle $(x - 9)^2 + (y - 12)^2 = 81$. The common internal tangent is a line with a y-intercept of $(0, b)$. $b = \underline{\hspace{1cm}}$. (nearest tenth)
- (A) 7.3 (B) 7.5 (C) 7.7 (D) 7.9 (E) 8.1
34. The graph of the equation $x^2 - 2xy + y^2 - 12x + 12y + 27 = 0$ is $\underline{\hspace{2cm}}$.
- (A) a parabola (B) an ellipse (C) a hyperbola (D) a circle (E) 2 parallel lines
35. The parametric equations $x(t) = (v_0 \cos \theta)t$ and $y(t) = y_0 + (v_0 \sin \theta)t - 2.68t^2$, $t > 0$, can be used to model the path of a projectile on the moon. Given: $v_0 = 120$ ft/s, $\theta = 39^\circ$, and $y_0 = 20$ ft. How far will the projectile travel horizontally from the moment it is launched until the instant it hits the ground? (nearest whole number)
- (A) 2652 ft (B) 2656 ft (C) 2660 ft (D) 2664 ft (E) 2668 ft
36. In his physics class, Mayank attached the top of a long spring to the ceiling. Then he attached a 400-g mass to the bottom of the spring and waited for the spring to come to rest at its equilibrium position. Then he pulled the mass down 12 cm and released it. The mass oscillated vertically between 12 cm below equilibrium and 12 cm above equilibrium. The position of the mass varied sinusoidally with time, with a period of one second. How far above the equilibrium position was the mass 1.4 seconds after it was released? (nearest tenth)
- (A) 8.9 cm (B) 9.1 cm (C) 9.3 cm (D) 9.5 cm (E) 9.7 cm
37. Find the sum of the series $\frac{1}{1} + \frac{2}{3} + \frac{9}{9} + \frac{28}{27} + \frac{65}{81} + \frac{126}{243} + \dots$ (nearest thousandth)
- (A) 5.625 (B) 5.627 (C) 5.629 (D) 5.631 (E) 5.633
38. The line $y = x - 2$ intersects the circle $x^2 + y^2 + 6x + 8y - 39 = 0$ at the points $P(e, f)$ and $Q(c, d)$. $PQ = \underline{\hspace{1cm}}$. (nearest tenth)
- (A) 15.3 (B) 15.6 (C) 15.9 (D) 16.2 (E) 16.5
39. Justin's Cal III teacher gave the students a list of 24 problems, 12 of which would be on the final exam. Justin studies hard and knows how to solve 20 of the problems. The teacher will award a grade of 96 to a student who correctly solves 10 of the problems, a 98 to a student who correctly solves 11 of the problems, or a 100 to a student who correctly solves all 12 problems. Find the probability that Justin will earn a score of 96 or 98 or 100 on the final exam. (nearest hundredth)
- (A) 0.70 (B) 0.73 (C) 0.76 (D) 0.79 (E) 0.82

40-42. Consider the graphs of $y = f(x)$ and $y = g(x)$ shown on the right.

40. The point $T(a, -44)$ lies on the graph of $y = f(x)$. If $a > 0$, then $a =$ _____.

- (A) 14
- (B) 15
- (C) 16
- (D) 17
- (E) 18



Problems 40, 41, 42

41. Find the area bounded by the graphs of $y = f(x)$ and $y = g(x)$. (nearest tenth)

- (A) 36.0
- (B) 36.2
- (C) 36.4
- (D) 36.6
- (E) 36.8

42. Find the volume of the solid whose base is the region bounded by the graphs of $y = f(x)$ and $y = g(x)$, with cross sections perpendicular to the x -axis. The cross sections are semicircles. (nearest whole number)

- (A) 47
- (B) 49
- (C) 51
- (D) 53
- (E) 55

43. Bug 1 starts at the origin and begins to walk up the y -axis at 5 mm/s. At the same time, bug 2 starts at point $A(700 \text{ mm}, 0)$ and begins to walk down parallel to the y -axis at 3 mm/s. The rate at which the distance between the bugs is increasing at $t = 4$ minutes is _____ mm/s. (nearest tenth)

- (A) 7.1
- (B) 7.3
- (C) 7.5
- (D) 7.7
- (E) 7.9

44. The rate at which Sammy, an Amazonian Giant Otter, is gaining weight is proportional to the difference between his adult weight and his current weight. At birth, Sammy weighed four pounds. On his first birthday, he weighed 16 pounds. Assume Sammy reaches 70 pounds as an adult. Find a model for Sammy's weight at any age. The model predicts that Sammy will weigh _____ pounds on his fifth birthday. (nearest tenth)

- (A) 44.7
- (B) 45.8
- (C) 46.9
- (D) 48.0
- (E) 49.1

45. Given: $f''(x) = 36x + 8$, $f(-1) = 3$, and $f(1) = 11$. If $f(c) = -9765$, then $c =$ _____.

- (A) -13
- (B) -12
- (C) -11
- (D) -10
- (E) -9

46. Suppose g is a differentiable function and suppose f is a function defined by $f(x) = g(x^2 - 3x)$. $f'(5) =$ _____.

- (A) $5g'(10)$
- (B) $6g'(5)$
- (C) $7g'(10)$
- (D) $12g'(5)$
- (E) $70g'(5)$

47. Let x and y be functions of time t that are related by the equation $2x^2 + 3y^2 - 4xy = 81$. At time $t = 3$, $x = 3$, $y > 0$, and $\frac{dx}{dt} = 4$. Find the value of $\frac{dy}{dt}$ at $t = 3$. (nearest tenth)
- (A) 2.1 (B) 2.3 (C) 2.5 (D) 2.7 (E) 2.9
48. Find the volume of the solid generated when the first quadrant region bounded by the graphs of $y_1 = 6$, $y_2 = x^2 + 2$ and the y -axis is revolved around the line $x = 10$. (nearest whole number)
- (A) 310 (B) 312 (C) 314 (D) 316 (E) 318
- 49-50. A particle is traveling along the x -axis. The position of the particle is given by $x(t) = 0.25t^4 - t^3 - 2t^2 + 12t - 8$, $t \geq 0$, $x(t)$ in feet and t in seconds.
49. Find the total distance traveled by the particle from $t = 0$ to $t = 4$. (nearest tenth)
- (A) 16.6 ft (B) 16.9 ft (C) 17.2 ft (D) 17.5 ft (E) 17.8 ft
50. The maximum speed of the particle when it is traveling to the left = _____ ft/s. (nearest tenth)
- (A) 1.1 (B) 1.3 (C) 1.5 (D) 1.7 (E) 1.9
51. Find the area of a single petal of the polar graph of $r = 6\cos(2\theta)$. (nearest tenth)
- (A) 13.3 (B) 13.5 (C) 13.7 (D) 13.9 (E) 14.1
52. Find the radius of convergence for the power series $\sum_{n=0}^{\infty} \frac{(n+2)}{(3n+1)!} (x-4)^n$.
- (A) 1 (B) 2 (C) 3 (D) 4 (E) ∞
53. Suppose 80% of NFL players who use PEDs have a positive result when tested. Also, suppose 90% of athletes who do not use PEDs have a negative result when tested. If 5% of NFL players use PEDs, what percent of NFL players would test negative when tested? (nearest tenth)
- (A) 83.5% (B) 84.5% (C) 85.5% (D) 86.5% (E) 87.5%
54. Events A and B are independent, $P(B) = 0.6$, and $P(A \text{ and } B) = 0.24$. $P(A \text{ or } B) =$ _____. (nearest hundredth)
- (A) 0.72 (B) 0.74 (C) 0.76 (D) 0.78 (E) 0.80
55. The time it takes Craig to travel from his home in Gainesville to his job at Tioga High School is approximately normally distributed with a mean of 26 minutes and a standard deviation of 3 minutes. Find the probability that on a randomly selected morning, Craig will leave Gainesville at 7:30 and arrive at Tioga High School at 8:00 or later. (nearest hundredth)
- (A) 0.03 (B) 0.05 (C) 0.07 (D) 0.09 (E) 0.11

Saturday #	1	2	3	4	5	6
Reps	8	12	15	21	28	32

56-57. Mr. Cantu decided to change his exercise program. Now, he finishes his workouts on Saturdays by seeing how many times he can squat 200 pounds. The results from the first 6 Saturdays are shown in the table above. Mr. Cantu analyzed the data by calculating a LSRL.

56. The value of the residual for Saturday #5 is _____ reps. (nearest tenth)

- (A) 0.8 (B) 1.0 (C) 1.2 (D) 1.4 (E) 1.6

57. Calculate the standard deviation of the residuals. The approximate size of a typical prediction error is _____ reps. (nearest tenth)

- (A) 1.3 (B) 1.5 (C) 1.7 (D) 1.9 (E) 2.1

58. Assume that the mean time spent each week prepping for UIL mathematics by students who qualified for the state meet is 240 minutes. If the weekly prep times of state qualifiers are approximately normally distributed and a weekly prep time of 300 minutes represents the 96th percentile, what is the approximate standard deviation of the prep times of state qualifiers in mathematics? (nearest tenth)

- (A) 32.1 min (B) 33.2 min (C) 34.3 min (D) 35.4 min (E) 36.5 min

Group 1	Fuel (no additive)	Mean = 32.0 mpg	SD = 1.1 mpg
Group 2	Fuel (with additive)	Mean = 34.4 mpg	SD = 1.3 mpg

59-60. An employee of Toyota has developed a fuel additive that he believes will increase gas mileage in a Camry by more than 2.0 mpg. To test the claim, Toyota selected 100 of their 2025 models and randomly placed them into two groups of 50. After two months of driving, the mean mpg of each group was calculated. Is there evidence that the additive improved the mpg of Camrys by more than 2.0 mpg? A senior analyst from Toyota carried out an appropriate test.

59. The value of the test statistic is _____. (nearest hundredth)

- (A) 1.60 (B) 1.63 (C) 1.66 (D) 1.69 (E) 1.72

60. The analyst used the conservative approach of letting $df = 49$. He calculated a p-value of _____. (nearest thousandth)

- (A) 0.028 (B) 0.036 (C) 0.044 (D) 0.052 (E) 0.060

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

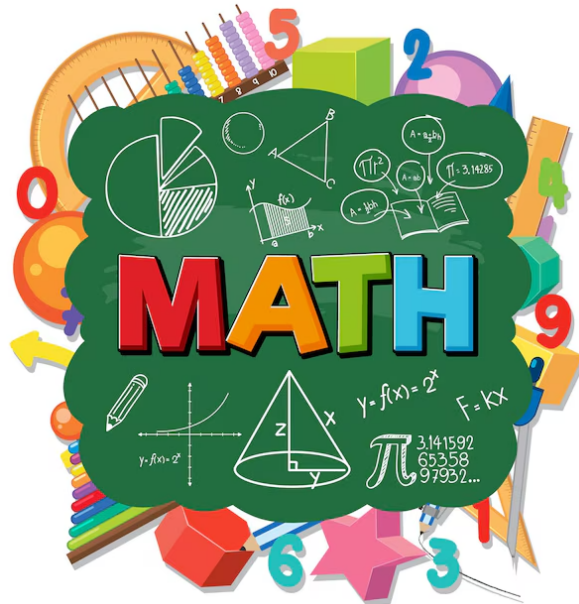
1. D	21. D	41. A
2. C	22. B	42. C
3. D	23. C	43. C
4. E	24. B	44. B
5. D	25. D	45. B
6. C	26. A	46. C
7. D	27. C	47. A
8. E	28. E	48. A
9. A	29. B	49. D
10. A	30. D	50. A
11. B	31. E	51. E
12. E	32. B	52. E
13. C	33. B	53. D
14. B	34. E	54. C
15. B	35. A	55. D
16. C	36. E	56. C
17. E	37. A	57. A
18.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



UNIVERSITY INTERSCHOLASTIC LEAGUE

Mathematics

State • 2025



DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!

1. Each of the top three students on the SEM math team answered 56 problems on a UIL mathematics test. If Justin missed two problems, Cayden missed three problems and Rohan missed four problems, what was their team score?
- (A) 934 (B) 936 (C) 938 (D) 940 (E) 942
2. Katherine left her home in Fort Bend and headed north on her bike. She cycled at a speed of 20 mph for 78 minutes. Then, she turned east and cycled at a speed of 24 mph for 90 minutes. Next, she turned south and cycled at a speed of 25 mph for 96 minutes. How far was she from home at this point? (nearest tenth)
- (A) 38.6 mi (B) 38.9 mi (C) 39.2 mi (D) 39.5 mi (E) 39.8 mi
3. In Mrs. Craven's BC Calculus class, the final grade each six weeks is calculated by taking 20% of a student's homework average, 50% of a student's quiz average, 30% of a student's test average, and adding those values. If Natalie's homework average was 96, her test average was 96, and her final grade was 92, what was her quiz average?
- (A) 80 (B) 82 (C) 84 (D) 86 (E) 88
4. Highland Park hosted a triangular meet with Argyle and Grapevine. Afterwards, all three teams went to Five Guys on Preston Road. Spencer paid \$56.30 for 3 burgers, 2 fries and 3 shakes. Sri paid \$63.15 for 3 burgers, 3 fries and 3 shakes. How much did Piyush pay for 4 burgers, 2 fries and 4 shakes?
- (A) \$66.75 (B) \$68.00 (C) \$69.25 (D) \$70.50 (E) \$71.75
5. All of the houses on 36th Street in Pharr are the same size. Jonathan can paint a house by himself in 14 hours. Kevin can paint a house by himself in 16 hours. Daniel can paint a house by himself in 18 hours. If they work together, how long would it take them to paint 12 houses on 36th Street? (nearest tenth)
- (A) 62.1 hr (B) 62.4 hr (C) 62.7 hr (D) 63.0 hr (E) 63.3 hr
6. Consider the sequence 5, 12, 19, 26, 33, 40, ... Find the sum of the 8th term and the 13th term.
- (A) 139 (B) 141 (C) 143 (D) 145 (E) 147
7. At the Paris Olympic Games, Cole Hocker of the U.S.A. set a new Olympic record when he won the gold medal in the 1500 meter run with a time of 3:27.65. Find his average speed. (nearest tenth)
- (A) 16.2 mph (B) 16.5 mph (C) 16.8 mph (D) 17.1 mph (E) 17.4 mph
8. Mrs. Jones uses a linear formula of the form $F = mA + b$, where F = final grade, m = slope, A = actual average, and b = constant, to calculate grades in her calculus class. In this year's class, she wants an actual average of 50 to convert to a final grade of 70, and an actual average of 100 to convert to a final grade of 100. Calculate the final grade of a student with an actual average of 70.
- (A) 78 (B) 80 (C) 82 (D) 84 (E) 86

9. Stephen left his home in Dallas and traveled to Newberg, Oregon for a college visit. On day 1, he traveled 612 miles at an average speed of 62 mph. On day 2, he traveled 606 miles at an average speed of 68 mph. On day 3, he traveled at an average speed of 72 mph. On day 4, he traveled 324 miles at an average speed of 58 mph. If the total driving time for the trip was 31 hr 12 min, how far did he travel on day 3? (nearest mile)

(A) 486 mi (B) 489 mi (C) 492 mi (D) 495 mi (E) 498 mi

10. Monday through Friday, I leave my house at 7:15 AM and drive to my office in downtown Dallas. Traffic can vary on my morning drive to work. On Tuesday, I drove to work at an average speed of 48 mph and arrived 7.5 minutes late. On Friday, I drove to work at an average speed of 72 mph and arrived 10 minutes early. How long is my morning drive to work? (nearest mile)

(A) 36 mi (B) 39 mi (C) 42 mi (D) 45 mi (E) 48 mi

11. It is exactly 7:50 PM. Find the measure of the acute angle formed by the hour hand and the minute hand of Grandma's kitchen clock. (nearest whole number)

(A) 63° (B) 65° (C) 67° (D) 69° (E) 71°

12. Consider a right rectangular prism with a length of 20, a width of 12 and a volume of 7680. Find the total surface area of the prism. (nearest whole number)

(A) 2512 (B) 2516 (C) 2520 (D) 2524 (E) 2528

13. Consider a hemisphere with a total surface area of 2723.76. Find the volume of the hemisphere. (nearest whole number)

(A) 10,282 (B) 10,286 (C) 10,290 (D) 10,294 (E) 10,298

- 14-15. $\triangle ABC$ is an equilateral triangle.

Point O is center of the circle with $OC = 6$.

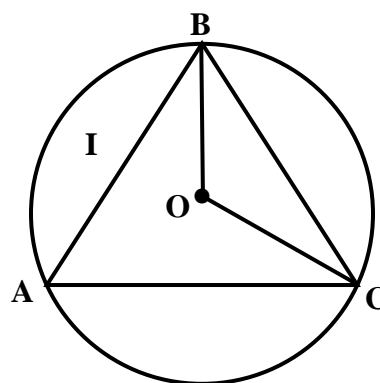
Region I is bounded by minor arc AB and \overline{AB} .

14. The length of minor arc BC = _____.
(nearest tenth)

(A) 12.3 (B) 12.6 (C) 12.9
(D) 13.2 (E) 13.5

15. The area of region I = _____. (nearest tenth)

(A) 21.2 (B) 21.5 (C) 21.8
(D) 22.1 (E) 22.4



Problems 14, 15

16. Consider regular pentagon ABCDE. The area of the circumscribed circle is 582. The area of the pentagon = _____. (nearest whole number)

(A) 424 (B) 428 (C) 432 (D) 436 (E) 440

17. Consider $\triangle ABC$ with $AC = 12$. If Point D lies on \overline{AC} with $\overline{BD} \perp \overline{AC}$, $AD = 5.4$ and $BD = 9$, then the perimeter of $\triangle ABC = \underline{\hspace{1cm}}$. (nearest tenth)

- (A) 33.7 (B) 33.9 (C) 34.1 (D) 34.3 (E) 34.5

18-19. Consider $\triangle DEF$ with $DE = EF = 12$. Point G lies on line \overleftrightarrow{DF} , but outside of $\triangle DEF$ with $DG = 18$ and $FG = 6$. Point M is the midpoint of line segment \overline{DE} .

18. The perimeter of $\triangle DEG = \underline{\hspace{1cm}}$. (nearest tenth)

- (A) 44.7 (B) 45.0 (C) 45.3 (D) 45.6 (E) 45.9

19. The area of $\triangle MEG = \underline{\hspace{1cm}}$. (nearest tenth)

- (A) 46.8 (B) 47.1 (C) 47.4 (D) 47.7 (E) 48.0

20. Given: $f(x) = 4x - 7$, $g(x) = 2x + 3$ and $h(x) = (f \circ g)(x)$. $h^{-1}(9) = \underline{\hspace{1cm}}$.

- (A) -1 (B) $-\frac{1}{2}$ (C) 0 (D) $\frac{1}{2}$ (E) 1

21. The windshield wiper on the rear window of a minivan rotates 150° . The total length of the wiper mechanism is 27 inches and the length of the wiper blade is 21 inches. The area covered by the wiper blade is square feet. (nearest tenth)

- (A) 6.0 (B) 6.3 (C) 6.6 (D) 6.9 (E) 7.2

22. Consider the graph of $f(x) = \frac{x^2 - 25}{x^3 + x^2 - 30x}$. The graph of $y = f(x)$ has asymptotes.

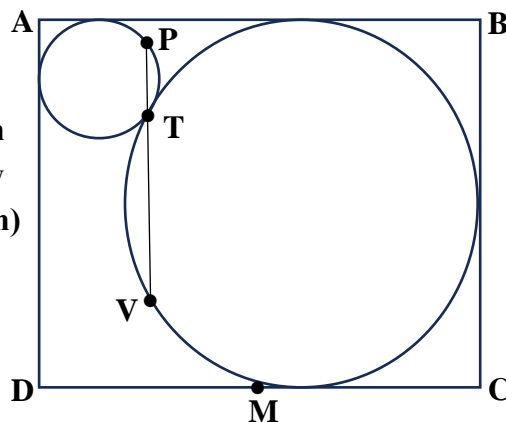
- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

23. Consider a geometric sequence in which all of the terms are positive numbers. The 2nd term is 54 and the 4th term is 30.375. Find the sum of the first 11 terms of the sequence. (nearest thousandth)

- (A) 275.533 (B) 275.634 (C) 275.735 (D) 275.836 (E) 275.937

24. Given: rectangle ABCD, $AD = 30$, $PV = 22.5$. \overline{PV} is parallel to \overline{BC} . Point M is the midpoint of \overline{DC} . The circles are tangent to the sides of the rectangle and to each other. Point T lies on \overline{PV} and is a point of tangency. Draw auxiliary line segment \overline{MB} . Find $m\angle MBC$. (nearest tenth)

- (A) 29.4° (B) 29.7° (C) 30.0°
(D) 30.3° (E) 30.6°

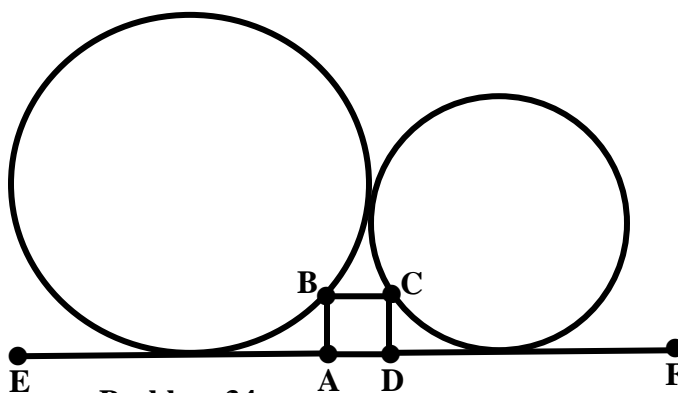


Problem 24

25. Michael placed \$245,000 into an account that earned $X\%$ annual interest compounded monthly. If it took 37 months to earn \$50,000 in interest, what is the value of X ? (nearest hundredth)
- (A) 5.82 (B) 5.93 (C) 6.04 (D) 6.15 (E) 6.26
26. Given: $\angle u$ in quadrant II, $\tan(u) = -\frac{12}{35}$, $\angle v$ in quadrant IV, $\tan(v) = -\frac{b}{a}$, a and b are positive integers with $0 < a < b$. If $\csc(u - v) = -\frac{481}{360}$, then $m\angle v = \underline{\hspace{2cm}}$. (nearest tenth)
- (A) 291.5° (B) 292.6° (C) 293.7° (D) 294.8° (E) 295.9°
27. Consider the polynomial $ax^5 + bx^4 + cx^3 + dx^2 + ex + f$. If $(2 + i)$ and $(2 + 3i)$ are two roots of the polynomial, and if $a = 1$ and $f = -12$, then $b = \underline{\hspace{2cm}}$.
- (A) $-\frac{556}{65}$ (B) $-\frac{546}{65}$ (C) $-\frac{538}{65}$ (D) $-\frac{532}{65}$ (E) $-\frac{528}{65}$
28. Boat A leaves port at 12:00 PM traveling on a bearing of 70° . Boat B leaves port at 1:00 PM traveling 6 mph faster than boat A on a bearing of 200° . At 6:00 PM, the distance between the boats was 286.4 miles. Find the speed of boat B. (nearest whole number)
- (A) 26 mph (B) 28 mph (C) 30 mph (D) 32 mph (E) 34 mph
29. The salary of a senior analyst increases by 12% every year. If the total amount she earned over her first 15 years was \$3,206,055, what was her salary her first year with the firm? (nearest dollar)
- (A) \$84,000 (B) \$85,000 (C) \$86,000 (D) \$87,000 (E) \$88,000
30. Consider an ellipse centered at $(-8, 3)$ with a vertex at $(-8, -4)$. If the point $(-10, 3)$ lies on the ellipse, what is the eccentricity of the ellipse? (nearest hundredth)
- (A) 0.80 (B) 0.84 (C) 0.88 (D) 0.92 (E) 0.96
31. Consider a parabola with a vertex at point $K(-6, -4)$ and with a focus at point $F(-6, -2)$. The points $A(-12, a)$ and $B(12, b)$ lie on the parabola. $AB = \underline{\hspace{2cm}}$. (nearest tenth)
- (A) 42.7 (B) 43.0 (C) 43.3 (D) 43.6 (E) 43.9
32. Consider a hyperbola with vertices at points $E(-3, 6)$ and $F(7, 6)$. The point $Q(15, 15.6)$ lies on the hyperbola. If the focal points are the points $T(t, 6)$ and $R(r, 6)$, then $TR = \underline{\hspace{2cm}}$. (nearest tenth)
- (A) 12.8 (B) 13.0 (C) 13.2 (D) 13.4 (E) 13.6
33. Consider the sequence 3, 7, 12, 18, 25, 33, 42, The sum of the first 20 terms is $\underline{\hspace{2cm}}$.
- (A) 1952 (B) 1956 (C) 1960 (D) 1964 (E) 1968

34. The circles are tangent to each other and to \overline{EF} . The area of the circles are 36π and 16π respectively. Find the area of square ABCD. (nearest hundredth)

(A) 3.54
(B) 3.66
(C) 3.78
(D) 3.90
(E) 4.02



Problem 34

35. A 6-ft-tall man is walking at 6 ft/s toward a streetlight that is 36-ft-tall. His 4-ft-tall son follows at the same speed, staying 12 ft behind him. At $t = 0$, the man is 200 ft from the streetlight. At $t = \underline{\hspace{1cm}}$ seconds, the tips of the shadows of the man and his son are exactly the same distance from the streetlight. (nearest tenth)

(A) 3.0 (B) 3.3 (C) 3.6 (D) 3.9 (E) 4.2

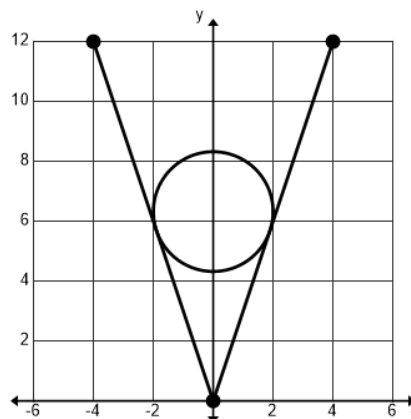
36. The comet Encke was the second periodic comet ever discovered. It has an elliptical orbit with an eccentricity of 0.8484. The length of the major axis is 4.429 AU and the period of its orbit is 1,200 days. If $1 \text{ AU} = 149.6 \times 10^9 \text{ m}$, then the perihelion distance of Encke's orbit is $\underline{\hspace{1cm}}$ km. (nearest km) The next perihelion is predicted to occur on February 10, 2027.

(A) 50,001,221 (B) 50,112,332 (C) 50,223,443 (D) 50,334,554 (E) 50,445,665

- 37-38. The center of the circle is the point $P(0, c)$ with $c > 6$. The radius of the circle is 2. $f(x) = |3x|$. The graph of $y = f(x)$ is tangent to the circle at two points.

37. $c = \underline{\hspace{1cm}}$. (nearest hundredth)

(A) 6.23 (B) 6.26
(C) 6.29 (D) 6.32
(E) 6.35



Problems 37, 38

38. Find the area of the region that lies between the two curves. (nearest tenth)

(A) 6.8 (B) 7.0 (C) 7.2 (D) 7.4 (E) 7.6

39. Consider the sequence $\frac{3}{1}, \frac{4}{1}, \frac{7}{2}, \frac{12}{6}, \frac{19}{24}, \frac{28}{120}, \dots$. The sum of the next two terms is $\underline{\hspace{1cm}}$.

(A) $\frac{43}{840}$ (B) $\frac{37}{720}$ (C) $\frac{65}{1008}$ (D) $\frac{29}{560}$ (E) $\frac{131}{2520}$

40. The directrix of the parabola is the line $x = \underline{\hspace{1cm}}$.

(A) $\frac{17}{8}$ (B) $\frac{9}{4}$ (C) $\frac{5}{2}$
 (D) $\frac{11}{4}$ (E) 3

41. The line tangent to the parabola at point Q intersects the x-axis at the point $(a, 0)$. $a = \underline{\hspace{1cm}}$.

(A) 18 (B) 20 (C) 22
 (D) 24 (E) 26

42. Find the area of the region bounded by the parabola and line segment \overline{PQ} . (nearest whole number)

(A) 33 (B) 34 (C) 35 (D) 36 (E) 37

43. Find the arclength of arc PV. (nearest tenth)

(A) 16.0 (B) 16.2 (C) 16.4 (D) 16.6 (E) 16.8

44. Joy Kennedy decided to construct a large box, shaped like a right rectangular prism, to store her UIL medals and trophies. The base length of the box needs to be twice the base width. The box must have a volume of 6 ft^3 . The minimal surface area of the six-sided box = $\underline{\hspace{1cm}} \text{ ft}^2$. (nearest tenth)

(A) 20.6 (B) 20.9 (C) 21.2 (D) 21.5 (E) 21.8

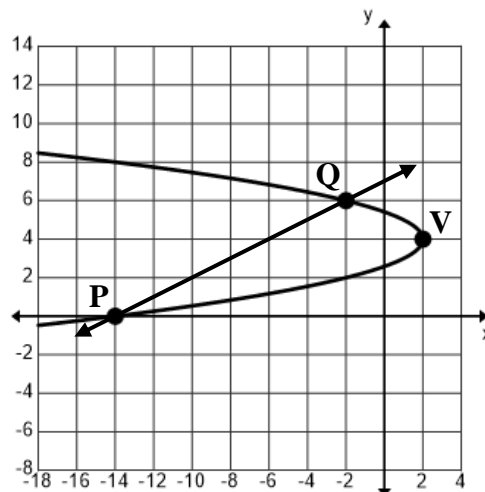
45. Over a 60-day period, water due to melting snow in the mountains entered the American Falls Reservoir at a rate given by $R(t) = .0205 \ln(t+1)$, $0 \leq t \leq 60$. Engineers began releasing water from the dam at the southern end of the reservoir's dam into the Snake River at a rate given by $D(t) = 0.00305t - 0.0000255t^2$, $0 \leq t \leq 60$. $R(t)$ and $D(t)$ are both measured in millions of acre-feet per day. At $t = 0$, the reservoir stored 0.894 million acre-feet of water. The maximum amount of water stored in the reservoir during this 60-day period was $\underline{\hspace{1cm}}$ million acre-feet. (nearest hundredth)

(A) 1.26 (B) 1.28 (C) 1.30 (D) 1.32 (E) 1.34

46. Consider the parametric equations $x(t) = \ln(4t+2)$ and $y(t) = 3t^2 + 4$ for $0 \leq t \leq 12$.

Find the value of $\frac{d^2y}{dx^2}$ when $t = \frac{1}{4}$. (nearest tenth)

(A) 4.1 (B) 4.3 (C) 4.5 (D) 4.7 (E) 4.9



Problems 40, 41, 42, 43

47. $f(x)$ is a continuous even function such that $\int_{-8}^8 f(x)dx = 36$ and $\int_8^{14} f(x)dx = 12$. $\int_{14}^0 f(x)dx = \underline{\hspace{2cm}}$.
- (A) -32 (B) -30 (C) -28 (D) -26 (E) -24
48. A particle is moving in the xy -plane. For $t \geq 0$, $\frac{dx}{dt} = 6t + 5$ and $\frac{dy}{dt} = \cos(t^2) - 9$. If $x(0) = 2$ and $y(0) = -4$, then the position of the particle at $t = 7$ is (a, b) . $a + b = \underline{\hspace{2cm}}$.
- (A) 114 (B) 116 (C) 118 (D) 120 (E) 122
- 49-50. Ranger Jim studied a population of grizzlies in the Gallatin National Forest near Bozeman over a period from 2000 to 2024. After analyzing all the data he collected, he decided that a logistic model was appropriate. Ranger Jim felt that the area could support a maximum of 400 bears. The initial population in 2000 was 16 bears. The population reached 40 bears in 2005.
49. Find Ranger Jim's logistic model for the grizzly population and predict the population in 2031.
- (A) 371 (B) 373 (C) 375 (D) 377 (E) 379
50. According to Ranger Jim's logistic model, the maximum rate of growth of the grizzly population during his study was $\underline{\hspace{2cm}}$ bears per year. (nearest tenth)
- (A) 19.0 (B) 19.3 (C) 19.6 (D) 19.9 (E) 20.2
51. Let f be a function with derivatives of all orders for $x > 0$ such that $f(2) = 1$, $f'(2) = 5$, $f''(2) = 9$, and $f'''(2) = 10$. Find $P_3(x)$, the third-degree Taylor polynomial for f about $x = 2$. $P_3(2.2) = \underline{\hspace{2cm}}$. (nearest hundredth)
- (A) 2.10 (B) 2.13 (C) 2.16 (D) 2.19 (E) 2.22
52. The graph of $f(x) = ax^3 + bx^2 + cx + d$ has a relative maximum at $(1, -5)$ and a point of inflection at $(-1, -21)$. $f(-6) = \underline{\hspace{2cm}}$. (nearest whole number)
- (A) 41 (B) 42 (C) 43 (D) 44 (E) 45
53. In a test of $H_0 : p = 0.28$ against $H_a : p \neq 0.28$, a random sample of size 400 yields a test statistic of $z = 2.03$. The P-value of this test is approximately equal to $\underline{\hspace{2cm}}$. (nearest thousandth)
- (A) 0.002 (B) 0.022 (C) 0.042 (D) 0.062 (E) 0.082
54. Assume the mean distance for men's long jumpers is 25 ft 8 in with a standard deviation of 9 in and the mean distance for women's long jumpers is 21 ft 2 in with a standard deviation of 8 in. If Trent jumped 27 ft 10 in, how far would Tara have to jump to have an equivalent performance? (nearest in)
- (A) 23 ft 1 in (B) 23 ft 3 in (C) 23 ft 5 in (D) 23 ft 7 in (E) 23 ft 9 in

55. Russell has played LeBron in one-on-one games hundreds of times. Russell wins 72% of the time. LeBron flew into Dallas to play 8 games with Russell. If the results of each game are independent of previous games, find the probability that LeBron will win at least 4 games. (nearest hundredth)

(A) 0.14 (B) 0.16 (C) 0.18 (D) 0.20 (E) 0.22

56. Sixty-two percent of the seniors at Newcastle plan to attend MIT, and 74% of those plan to major in math. All of the other seniors plan to attend Harvard, and 36% of those plan to major in math. Given that a randomly selected senior plans to major in math, what is the probability that the senior plans to attend Harvard? (nearest hundredth)

(A) 0.17 (B) 0.19 (C) 0.21 (D) 0.23 (E) 0.25

Flavor	Chocolate	Vanilla	Strawberry	Rocky Road
# of cones sold	63	54	39	44

57. At Madelin's Ice Cream Shoppe in Plains, she expects to sell an equal number of ice cream cones of each of the four flavors they offer every Saturday. The results from one randomly selected Saturday are in the table above. Are these results convincing evidence that Madelin's Ice Cream Shoppe does not sell an equal number of each flavor on Saturdays? Madelin performed an appropriate test at the $\alpha = 0.05$ level. After analyzing the test results, Madelin stated "Based on a p-value of _____, there is insufficient evidence to conclude that the sales are not evenly distributed among the 4 flavors." (nearest thousandth)

(A) 0.044 (B) 0.055 (C) 0.066 (D) 0.077 (E) 0.088

Final Score - S	0	1	2	3	4
P(S)	0.1	0.2	0.3	0.25	0.15

58. Ashley's favorite game is a game of chance with five possible final scores. The possible scores and the probability of each score is given in the table above. Ashleigh has enough time to play the game twice on the trip back to Newcastle. The second play is independent of the first play. Find the probability that the sum of final scores of two plays is 4. (nearest hundredth)

(A) 0.18 (B) 0.20 (C) 0.22 (D) 0.24 (E) 0.26

59. Dr. Williams spends his summers in Northern Idaho studying the Idaho Snow Bunny. As part of his research, he needs to construct a 96% confidence interval for the average weight of adult snow bunnies. Based on his previous research, he estimates that the standard deviation is 0.22 kg. Dr. Williams plans to select a random sample of adult snow bunnies and record their weights. Of the following, which is the smallest sample size that will result in a margin of error of 0.02 kg or less for the confidence interval?

(A) 391 (B) 421 (C) 451 (D) 481 (E) 511

60. The mean IQ of the students in the room is 125 with a standard deviation of 10. If a student has an IQ of 140, what percentile does that place the student at?

(A) 89th (B) 91st (C) 93rd (D) 95th (E) 97th

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**University Interscholastic League
MATHEMATICS CONTEST
HS • State Meet • 2025
Answer Key**

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