

Mathematics

Region • 2025



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- 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/s², and $\Delta x =$ 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/s². (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 cm², 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



- 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 cm², then the total surface area of the cube = _____ cm². (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]



- 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. \overrightarrow{PV} is parallel to \overrightarrow{BC} . The circles are tangent to the sides of the rectangle and to each other. Point T lies on \overrightarrow{PV} and is a point of tangency. Draw auxiliary line segment \overrightarrow{DB} . DB =_____. (nearest tenth)
 - (A) 39.5 (B) 39.7 (C) 39.9
 - (D) 40.1 (E) 40.3



- 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 =_____. (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 _____.

- (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 = ______. (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



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 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)

Page 6

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 $x(t) = 0.25t^4 - t^3 - 2t^2 + 12t - 8$, $t \ge 0$, 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) (D) 13.9 (A) 13.3 **(B)** 13.5 (C) 13.7 (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) oo 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 and B) = 0.24. P(A or B) = . (nearest hundredth) (C) 0.76 (A) 0.72 **(B)** 0.74 **(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) **(B) 0.05** (D) 0.09 (A) 0.03 (C) 0.07 (E) 0.11 **UIL Mathematics**

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