PRACTICE EXAM 31

NY REGENTS ALGEBRA I SIMULATION — 35 QUESTIONS

Recommended Time: 90 Minutes

Required Tools: Graphing Calculator, Straightedge

Directions: This exam consists of 35 multiple-choice questions. Each question is worth equal credit. Select the single best answer for each question. No penalty for guessing.

1. Solve for x: $(x/3) + 4 = (x/2) - 1$.

A. $x = 10$

B. $x = 30$

C. $x = 6$

D. $x = -30$

2. If $f(x) = x^2 - 4x$ and $g(x) = 2x + 1$, what is the value of $f(g(2))$?

A. -4

B. 13

C. 21

D. 5

3. Which inequality represents the solution to $-3 \leq 2x - 5 < 7$?

A. $1 \leq x < 6$

B. $1 < x \leq 6$

C. $-4 \leq x < 1$

D. $4 \leq x < 6$

4. Given the function f(x) = 3(2)^x, what is the value of f(4) − f(2)?

A. 24

B. 12

C. 36

D. 60

5. What are the coordinates of the vertex of the parabola $y = x^2 - 6x + 11$?

A. $(-3, 2)$

B. $(3, 2)$

C. $(3, -2)$

D. $(6, 11)$

6. Which expression is the completely factored form of $4x^2 - 12x + 9$?

A. $(2x - 3)^2$

B. $(2x + 3)^2$

C. $(4x - 3)(x - 3)$

D. $(2x - 3)(2x + 3)$

7. What is the solution to the system $3x - 2y = 4$ and $x + 2y = 12$?

A. (2, 5)

B. (4, −4)

C. (5, 2)

D. (4, 4)

8. A geometric sequence begins 5, 10, 20, 40, … Which explicit formula represents the nth term?

A. $a_n = 2(5)^{\wedge}(n - 1)$

B. $a_n = 5 + 5(n - 1)$

C. $a_n = 5(2)^{\wedge}(n - 1)$

D. $a_n = 5(2)^{\wedge}n$

9. For the function $f(x) = x^2$, what is the average rate of change from $x = 2$ to $x = 5$?

A. 7

B. 21

C. 9

D. 3

10. A bacteria culture grows according to P(t) = 200(1.25)^t, where t is measured in hours. By what percent does the population increase each hour?

A. 125%

B. 25%

C. 1.25%

D. 200%

11. A linear function passes through the points (−1, 5) and (2, −4). What is the rate of change of the function?

A. 3

B. −1/3

C. 1/3

D. −3

12. Which equation has roots of x = −5 and x = 2?

A. $x^2 + 3x - 10 = 0$

B. $x^2 - 3x - 10 = 0$

C. $x^2 + 3x + 10 = 0$

D. $x^2 - 7x + 10 = 0$

13. A theater charges $12 per ticket, modeled by $C(t) = 12t$, where t is a whole number of tickets from 0 to 8. Which set best represents the range of this function?

A. {0, 1, 2, …, 8}

B. all real numbers from 0 to 96

C. {0, 12, 24, 36, 48, 60, 72, 84, 96}

D. {12, 24, 36, …, 96}

14. Which expression is equivalent to $(2x - 3)(x^2 + 4x - 1)$?

A. $2x^3 + 5x^2 - 14x - 3$

B. $2x^3 + 5x^2 - 14x + 3$

C. $2x^3 + 11x^2 - 14x + 3$

D. $2x^3 - 5x^2 + 14x + 3$

15. A student has $50 to spend on notebooks costing $4 each and one pen costing $6. Which inequality represents the number n of notebooks the student can buy?

A. $4n + 6 \geq 50$

B. $4n \leq 50$

C. $6n + 4 \leq 50$

D. $4n + 6 \leq 50$

16. A data set summarizing daily high temperatures over a month has a minimum of 10, Q1 = 18, median = 24, Q3 = 30, and maximum = 40. What is the median daily high temperature?

A. 18

B. 30

C. 24

D. 22

17. What are the solutions to the equation $x^2 + 4x - 6 = 0$?

A. $x = -2 \pm \sqrt{10}$

B. $x = -4 \pm \sqrt{10}$

C. $x = 2 \pm \sqrt{10}$

D. $x = -2 \pm \sqrt{40}$

18. The graph of $f(x) = x^2$ is transformed into $g(x) = -(x - 2)^2 + 3$. Which describes the transformation?

A. Reflected over the x-axis, shifted left 2 and up 3

B. Reflected over the x-axis, shifted right 2 and up 3

C. Reflected over the y-axis, shifted right 2 and up 3

D. Reflected over the x-axis, shifted right 2 and down 3

19. The sum of two numbers is 24 and their difference is 6. What is the larger of the two numbers?

A. 9

B. 12

C. 15

D. 18

20. A line of best fit is given by $\hat{y} = 2.5x + 8$. For an x-value of 6, the observed data value is 20. What is the residual?

A. 3

B. 23

C. 20

D. −3

21. A function passes through the points (0, 4), (1, 12), (2, 36), and (3, 108). Which function models the data?

A. $y = 4(3)^x$

B. $y = 3(4)^x$

C. $y = 4x + 3$

D. $y = 4 + 8x$

22. What is the slope of the line represented by the equation $6x - 3y = 12$?

A. -2

B. 6

C. 2

D. 1/2

23. Test scores for a class were grouped into the following intervals: [50, 60) had 3 students, [60, 70) had 7 students, [70, 80) had 10 students, [80, 90) had 8 students, and [90, 100) had 2 students. How many students scored 70 or above?

A. 18

B. 20

C. 12

D. 25

24. A projectile's height in feet is modeled by $h(t) = -16t^2 + 64t$, where t is in seconds. At what time does the projectile reach its maximum height?

A. 4

B. 64

C. 1

D. 2

25. The area of a triangle is given by $A = (1/2)bh$. Which equation correctly solves this formula for h?

A. $h = 2A/b$

B. $h = A/(2b)$

C. $h = 2A - b$

D. $h = Ab/2$

26. What are the solutions to the equation $|x - 3| = 7$?

A. $x = 10$ only

B. $x = 4$ and $x = -10$

C. $x = 10$ and $x = -4$

D. $x = -10$ and $x = -4$

27. The first term of an arithmetic sequence is 8 and the common difference is −3. What is the 10th term?

A. −22

B. −19

C. −30

D. 35

28. The cost to rent a kayak is modeled by $C(h) = 15h + 25$, where h is the number of hours. What does the constant 25 represent in this context?

A. The hourly rental rate

B. The total number of hours

C. The cost per additional kayak

D. The fixed base fee regardless of hours

29. Which expression is the completely factored form of $2x^2 - 50$?

A. $2(x - 5)(x + 5)$

B. $2(x - 5)^2$

C. $(x - 25)(x + 2)$

D. $(2x - 5)(x + 10)$

30. A linear inequality has a dashed boundary line passing through (0, 3) and (3, 0), with the region below and to the left of the line shaded. Which inequality is represented?

A. $y > -x + 3$

B. $y < -x + 3$

C. $y \leq -x + 3$

D. $y \geq -x + 3$

31. How many real solutions does the equation $2x^2 + 3x + 5 = 0$ have?

A. One real solution

B. Two real solutions

C. No real solutions

D. Infinitely many solutions

32. A laptop purchased for $1,200 loses 20% of its value each year. What is its value after 2 years?

A. $960

B. $480

C. $720

D. $768

33. Four data sets each produced a correlation coefficient. Which value indicates the strongest linear relationship?

A. $r = 0.45$

B. $r = -0.89$

C. $r = 0.62$

D. $r = -0.30$

34. Which system of equations has infinitely many solutions?

A. $y = 2x - 4$ and $4x - 2y = 8$

B. $y = 2x - 4$ and $y = 2x + 1$

C. $y = 3x$ and $y = -3x$

D. $y = x + 1$ and $y = 2x$

35. A parabola opens upward, crosses the x-axis at $(-1, 0)$ and $(5, 0)$, and has its vertex at $(2, -5)$. What is the equation of the axis of symmetry of the parabola?

A. $x = -1$

B. $x = 5$

C. $x = 2$

D. x = 4

ANSWER KEY WITH EXPLANATIONS — PRACTICE EXAM 31

1. B — x = 30. Multiplying every term by the common denominator 6 clears the fractions to give 2x + 24 = 3x − 6, and collecting like terms yields 2x = 18, so x = 30. Clearing denominators first turns a fractional equation into a routine linear one and prevents arithmetic slips.
2. D — 5. Function composition works from the inside out: g(2) = 2(2) + 1 = 5, then f(5) = 5^2 − 4(5) = 25 − 20 = 5. Evaluating the inner function before the outer one is essential, since reversing the order produces a different result.
3. A — 1 ≤ x < 6. Adding 5 to all three parts of the compound inequality gives 2 ≤ 2x < 12, and dividing by 2 gives 1 ≤ x < 6. Operations on a compound inequality must be applied to all three parts at once to preserve the relationship.
4. C — 36. Evaluating gives f(4) = 3$(2)^4$ = 48 and f(2) = 3$(2)^2$ = 12, so the difference is 48 − 12 = 36. Each input must be raised as an exponent before multiplying by the coefficient, reflecting how quickly exponential values grow.
5. B — (3, 2). The x-coordinate of the vertex is −b/(2a) = 6/2 = 3, and substituting gives y = 9 − 18 + 11 = 2. The vertex marks the minimum of this upward-opening parabola, the lowest point on the entire graph.
6. A — $(2x - 3)^2$. The expression is a perfect-square trinomial because $4x^2 = (2x)^2$, $9 = (-3)^2$, and the middle term −12x equals 2(2x)(−3). Recognizing perfect-square form avoids trial-and-error factoring and signals a double root.
7. D — (4, 4). Adding the two equations eliminates y to give 4x = 16, so x = 4, and substituting into x + 2y = 12 gives y = 4. The elimination method works cleanly here because the y-terms are already opposites.
8. C — a_n = 5(2)^(n − 1). The first term is 5 and each term doubles, giving a common ratio of 2, so the geometric formula is $a_1 \cdot r^{(n-1)}$. Placing the first term as the coefficient and the ratio as the base distinguishes geometric growth from the linear distractor.
9. B — 7. The average rate of change is the change in output over the change in input: (25 − 4)/(5 − 2) = 21/3 = 7. For a nonlinear function this gives the slope of the secant line between the two points, not a constant slope.
10. A — 25%. Written as a(1 + r)^t, the base 1.25 means r = 0.25, a 25% increase each hour. Reading the growth factor as 1 + r rather than as the rate itself separates the answer from the 125% distractor.
11. D — −3. Using the two given points, the slope is (−4 − 5)/(2 − (−1)) = −9/3 = −3. A line falling from left to right must have a negative rate of change, which rules out the positive distractors.
12. A — $x^2 + 3x - 10 = 0$. Roots of −5 and 2 correspond to factors (x + 5)(x − 2), and expanding gives $x^2 + 3x - 10$. Each root r produces a factor (x − r), so the sum and product of the roots determine the middle and constant terms.

13. C — {0, 12, 24, …, 96}. The range is the set of outputs C(t) = 12t as t takes whole-number values from 0 to 8, producing the multiples of 12 from 0 through 96. The range consists of outputs and must include 0, distinguishing it from the domain and from the set that omits zero.
14. B — $2x^3 + 5x^2 - 14x + 3$. Distributing each term of $(2x - 3)$ across the trinomial and combining like terms gives $2x^3 + (8 - 3)x^2 + (-2 - 12)x + 3$. Tracking the sign of the −3 through every product prevents the sign errors in the distractors.
15. D — $4n + 6 \leq 50$. The total cost is the $6 pen plus $4 per notebook, and this must stay within the $50 budget, giving $4n + 6 \leq 50$. Modeling the fixed cost as a constant and the per-item cost as a variable rate produces the correct inequality.
16. C — 24. The median is the value marked at the center of the five-number summary, halfway between Q1 and Q3 in position. The median represents the middle of the data, splitting the recorded temperatures into two equal halves.
17. A — $x = -2 \pm \sqrt{10}$. The quadratic formula gives $x = [-4 \pm \sqrt{(16 + 24)}]/2 = [-4 \pm \sqrt{40}]/2$, and simplifying $\sqrt{40} = 2\sqrt{10}$ reduces this to $-2 \pm \sqrt{10}$. Reducing the radical and dividing every term by 2 is required to reach the simplest exact form.
18. C — reflected over the x-axis, shifted right 2 and up 3. The negative sign reflects the parabola over the x-axis, $(x - 2)$ shifts it right 2, and + 3 shifts it up 3. Horizontal shifts move opposite the sign attached to x, while the outside constant controls the vertical shift.
19. C — 15. Letting the numbers be x and y, $x + y = 24$ and $x - y = 6$; adding gives $2x = 30$, so $x = 15$. Adding the two equations eliminates the smaller number and isolates the larger one directly.
20. D — −3. The predicted value is $2.5(6) + 8 = 23$, and the residual is observed minus predicted: $20 - 23 = -3$. A negative residual means the actual data point lies below the line of best fit.
21. A — y = 4(3)^x. Each y-value is three times the previous one, indicating a constant ratio of 3 and an initial value of 4 at x = 0. A constant multiplicative ratio identifies exponential growth, unlike the constant difference that would signal a linear model.
22. C — 2. Solving $6x - 3y = 12$ for y gives $-3y = -6x + 12$, so $y = 2x - 4$, revealing a slope of 2. Converting to slope-intercept form exposes the coefficient of x as the slope.
23. D — Median; the value 88 is an outlier that would distort the mean. Without a clear count of all categories — wait, this is the histogram question. Let me revise.

Actually let me re-do Q23 since the regenerated stem is the histogram question, not the data-sets question.

23. B — 20. Adding the frequencies for the intervals at or above 70 gives 10 + 8 + 2 = 20 students. Reading the frequencies for the relevant intervals and summing them answers cumulative frequency questions.
24. B — 2. The time of maximum height is the vertex of the parabola, found at $t = -b/(2a) = -64/(2 \cdot -16) = 2$ seconds. For a downward-opening height function, the vertex marks the instant of greatest height before the object falls.
25. A — $h = 2A/b$. Multiplying both sides of $A = (1/2)bh$ by 2 gives $2A = bh$, and dividing by b isolates $h = 2A/b$. Reversing the operations applied to the target variable is the core technique of literal-equation solving.

26. C — $x = 10$ and $x = -4$. An absolute-value equation splits into two cases: $x - 3 = 7$ gives $x = 10$, and $x - 3 = -7$ gives $x = -4$. The two solutions reflect that a quantity and its opposite share the same distance from zero.
27. B — -19. The 10th term is $a_1 + d(n - 1) = 8 + (-3)(9) = 8 - 27 = -19$. Multiplying the common difference by one less than the term number accounts for the steps taken from the first term.
28. D — the fixed base fee regardless of hours. In $C(h) = 15h + 25$, the constant 25 is the y-intercept, the cost incurred even when $h = 0$. The constant term represents a fixed charge, while the coefficient 15 represents the per-hour rate.
29. A — $2(x - 5)(x + 5)$. Factoring out the greatest common factor 2 leaves $x^2 - 25$, a difference of squares that factors into $(x - 5)(x + 5)$. Removing the GCF first lets the remaining binomial be recognized and fully factored.
30. B — $y < -x + 3$. The dashed boundary line indicates a strict inequality, and shading below the line corresponds to y-values less than the boundary. A dashed line excludes the boundary points, while shading below signals the "less than" relationship.
31. C — no real solutions. The discriminant $b^2 - 4ac = 9 - 40 = -31$ is negative, so the equation has no real solutions. A negative discriminant means the parabola never crosses the x-axis.
32. D — \$768. Each year the laptop retains 80% of its value, so after 2 years the value is $1200(0.8)^2 = 1200(0.64) = 768$. Exponential decay applies the retention factor once per period, compounding the loss rather than subtracting a flat amount.
33. B — $r = -0.89$. The strength of a linear relationship depends on the absolute value of r, and $|-0.89|$ is the largest among the choices. A coefficient closest to ± 1 indicates the strongest association, regardless of whether it is positive or negative.
34. A — $y = 2x - 4$ and $4x - 2y = 8$. Rewriting $4x - 2y = 8$ as $y = 2x - 4$ shows it is identical to the first equation, so the two represent the same line and share every point. Two equations that reduce to the same line yield infinitely many solutions.
35. C — $x = 2$. The axis of symmetry passes through the vertex's x-coordinate, which is also the midpoint of the x-intercepts: $(-1 + 5)/2 = 2$. A parabola is symmetric about the vertical line through its vertex, which lies exactly halfway between the two roots.