PRACTICE EXAM 34

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: $6 - 4(x + 2) = 2(3 - x)$.

A. $x = -2$

B. $x = -4$

C. $x = 4$

D. $x = 2$

2. A line passes through the points $(3, -4)$ and $(-1, 8)$. Which equation represents this line?

A. $y = -3x - 4$

B. $y = 3x + 4$

C. $y = -3x + 4$

D. $y = -3x + 5$

3. A culture of bacteria starts at 500 cells and triples every hour. Which function models the number of cells N after t hours?

A. N(t) = 500(3)^t

B. N(t) = 500 + 3t

C. N(t) = 3(500)^t

D. N(t) = 500(1/3)^t

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

A. $9x^2 + 4$

B. $9x^2 + 6x + 4$

C. $9x^2 + 12x + 4$

D. $6x^2 + 12x + 4$

5. What are the zeros of the function $f(x) = x^2 - 6x + 5$?

A. $x = -1$ and $x = 5$

B. $x = 1$ and $x = 5$

C. $x = 6$ and $x = 5$

D. $x = -1$ and $x = -5$

6. A function is defined as $f(x) = 4x - 9$. What is the value of $f(7)$?

A. 19

B. 28

C. -19

D. 37

7. Which inequality represents the solution to $3(x - 2) \geq 5x + 4$?

A. $x \geq -5$

B. $x \leq -1$

C. $x \geq -1$

D. $x \leq -5$

8. Two functions are graphed on the same coordinate plane: a linear function f(x) = 2x + 2 with positive slope passing through (0, 2) and (3, 8), and an exponential curve g(x) = 2^x passing through (0, 1), (1, 2), (2, 4), and (3, 8). The two graphs intersect at (3, 8). For what value of x do f(x) and g(x) have the same output?

A. $x = 0$

B. $x = 1$

C. $x = 3$

D. $x = 8$

9. Which expression represents the sum of $(5x^2 - 2x + 7)$ and $(3x^2 + 4x - 9)$?

A. $8x^2 + 2x + 16$

B. $8x^2 + 2x - 2$

C. $8x^2 - 6x - 2$

D. $2x^2 + 6x - 16$

10. A scientist solves $x^2 + 6x - 11 = 0$ by completing the square. Which equivalent equation is the result of completing the square?

A. $(x + 3)^2 = 20$

B. $(x + 3)^2 = 11$

C. $(x - 3)^2 = 20$

D. $(x + 6)^2 = 47$

11. A line of best fit is $\hat{y} = -1.2x + 30$. The observed data at $x = 10$ is 14. What is the residual?

A. -18

B. 4

C. -4

D. 18

12. Which expression is the completely factored form of $x^2 - 11x + 28$?

A. $(x - 4)(x + 7)$

B. $(x + 4)(x - 7)$

C. $(x - 14)(x + 2)$

D. $(x - 4)(x - 7)$

13. A student earns 90 on each of two exams and 75 on a third exam. The exams are weighted equally. What is the student's mean exam score?

A. 80

B. 85

C. 87

D. 82.5

14. A car rental costs $40 per day plus $0.25 per mile driven. Which equation represents the total cost C of renting the car for one day and driving m miles?

A. $C = 0.25m + 40$

B. $C = 40m + 0.25$

C. $C = 40 + 25m$

D. $C = 0.25(m + 40)$

15. A geometric sequence has a first term of 64 and a common ratio of 1/2. What is the fifth term?

A. 16

B. 8

C. 4

D. 2

16. A downward-opening parabola has its vertex at (−1, 5) and crosses the x-axis at (−4, 0) and (2, 0). What is the axis of symmetry of the parabola?

A. $y = 5$

B. $x = 2$

C. $x = 0$

D. $x = -1$

17. A function is defined by $f(x) = x^2 + 3$. Over the interval from $x = 1$ to $x = 4$, what is the average rate of change of $f(x)$?

A. 4

B. 5

C. 15

D. 19

18. Which statement correctly describes the end behavior of the function f(x) = (1/2)^x?

A. As $x \to \infty$, $f(x) \to 0$; as $x \to -\infty$, $f(x) \to \infty$

B. As $x \to \infty$, $f(x) \to \infty$; as $x \to -\infty$, $f(x) \to 0$

C. As $x \to \infty$, $f(x) \to -\infty$; as $x \to -\infty$, $f(x) \to 0$

D. As $x \to \infty$, $f(x) \to 0$; as $x \to -\infty$, $f(x) \to -\infty$

19. A square has an area of 121 square inches. What is the length of each side?

A. 60.5 inches

B. 22 inches

C. 12.1 inches

D. 11 inches

20. A pool is being filled. The volume V (in gallons) after t minutes is given by V(t) = 8t + 50. What does the y-intercept represent in this context?

A. The rate at which the pool is filling

B. The total volume after 50 minutes

C. The initial amount of water in the pool

D. The number of minutes to fill the pool

21. Which value of x is a solution to $(x - 3)(2x + 7) = 0$?

A. $x = 3$ and $x = 7$

B. $x = 3$ and $x = -7/2$

C. $x = -3$ and $x = 7/2$

D. $x = -3$ and $x = -7/2$

22. The number of books in a small library collection grouped by page count is as follows: [100, 200) has 6 books, [200, 300) has 12 books, [300, 400) has 18 books, [400, 500) has 10 books, and [500, 600) has 4 books. How many books in the library have 300 or more pages?

A. 28

B. 14

C. 18

D. 32

23. Which function has a y-intercept of (0, −4) and a slope of 2/3?

A. $y = (2/3)x - 4$

B. $y = -4x + 2/3$

C. $y = (3/2)x - 4$

D. $y = (2/3)x + 4$

24. A line passes through (0, 5) and is parallel to the line $y = -4x + 1$. Which equation represents this line?

A. $y = (1/4)x + 5$

B. $y = 4x + 5$

C. $y = -4x + 5$

D. $y = -4x - 5$

25. A function is defined by $f(x) = x^2 - 4x + 1$. Which form of the function reveals the vertex most directly?

A. $f(x) = (x - 4)^2 + 1$

B. $f(x) = (x - 2)^2 - 3$

C. $f(x) = x(x - 4) + 1$

D. $f(x) = (x - 2)^2 + 1$

26. Two consecutive even integers have a sum of 54. What is the larger integer?

A. 24

B. 25

C. 26

D. 28

27. A student tracks the temperature of a cooling object. Which type of function would best model an object cooling toward room temperature?

A. Exponential decay

B. Linear with positive slope

C. Quadratic with a maximum

D. Linear with zero slope

28. A system of two linear equations consists of Line 1, which passes through (0, 5) and (5, 0) with a negative slope, and Line 2, which passes through (0, −2) and (4, 2) with a positive slope. The two lines intersect at exactly one point. How many solutions does this system have?

A. None

B. Two

C. Exactly one

D. Infinitely many

29. A bag contains 6 red marbles and 4 blue marbles. One marble is drawn at random. What is the probability of drawing a blue marble?

A. 4/6

B. 6/10

C. 1/2

D. 2/5

30. The function $f(x) = 2x^2 - 8x + 5$ has what type of vertex?

A. A maximum, because the parabola opens downward

B. A minimum, because the leading coefficient is positive

C. Neither a maximum nor a minimum

D. A vertical asymptote at $x = 2$

31. A line passes through $(-2, 3)$ and is perpendicular to $y = (1/4)x + 7$. Which equation represents this line?

A. $y = -4x - 5$

B. $y = 4x + 11$

C. $y = (1/4)x + 5$

D. $y = -(1/4)x - 5$

32. A scatter plot shows a strong linear relationship between x and y, with a slope of about 5. Which statement is most accurate?

A. The correlation coefficient is exactly 1

B. Causation is established by the strong relationship

C. A unit increase in x is associated with about a 5-unit increase in y

D. The scatter plot cannot be used to make predictions

33. A class collects data on the number of pets owned by each student. The mean is 1.8 and the median is 2. Which statement best explains the difference between these values?

A. The mean must always exceed the median

B. The data set likely contains a few low outliers pulling the mean down

C. Half of the students own no pets

D. The mode of the data set is 1.8

34. Two functions f(x) and g(x) are recorded in a table. At x = 0, f(x) = 1 and g(x) = 3. At x = 1, f(x) = 3 and g(x) = 5. At x = 2, f(x) = 9 and g(x) = 7. At x = 3, f(x) = 27 and g(x) = 9. At x = 4, f(x) = 81 and g(x) = 11. Which statement correctly compares the two functions?

A. f(x) is linear; g(x) is exponential

B. Both f(x) and g(x) are linear

C. Both f(x) and g(x) are exponential

D. f(x) is exponential; g(x) is linear

35. A swimming pool's depth in feet is modeled by $d(x) = -0.05x + 8$, where x is the horizontal distance in feet from the shallow end. What does the slope represent in this context?

A. The depth decreases by 0.05 ft per horizontal foot

B. The depth at the deep end is 8 feet

C. The slope has no physical meaning

D. The depth increases by 0.05 ft per horizontal foot

ANSWER KEY WITH EXPLANATIONS — PRACTICE EXAM 34

1. B — $x = -4$. Distributing gives $6 - 4x - 8 = 6 - 2x$, which simplifies to $-4x - 2 = 6 - 2x$, and isolating x yields $-2x = 8$, so $x = -4$. Distributing both sides carefully before collecting like terms is essential when negative coefficients are involved.
2. D — $y = -3x + 5$. The slope is $(8 - (-4))/(-1 - 3) = 12/(-4) = -3$, and substituting $(3, -4)$ gives $-4 = -3(3) + b$, so $b = 5$. Calculating the slope first and then locating the intercept yields the equation in slope-intercept form.
3. A — $N(t) = 500(3)^t$. Tripling every hour means the population is multiplied by 3 for each unit of t, with initial value 500. Exponential growth uses a base equal to the growth factor, distinguishing it from a linear additive model.
4. C — $9x^2 + 12x + 4$. Squaring a binomial follows $(a + b)^2 = a^2 + 2ab + b^2$, giving $(3x)^2 + 2(3x)(2) + 2^2 = 9x^2 + 12x + 4$. The middle term comes from twice the product of the two terms, which the missing-middle distractor omits.
5. B — $x = 1$ and $x = 5$. Factoring $x^2 - 6x + 5$ gives $(x - 1)(x - 5) = 0$, so the zeros are 1 and 5. The factors must multiply to 5 and add to -6, which -1 and -5 satisfy.
6. A — 19. Substituting $x = 7$ gives $f(7) = 4(7) - 9 = 28 - 9 = 19$. Function notation requires replacing every x with the input value before evaluating.
7. D — $x \leq -5$. Distributing gives $3x - 6 \geq 5x + 4$; subtracting 5x and adding 6 gives $-2x \geq 10$, and dividing by -2 reverses the inequality to $x \leq -5$. Reversing the inequality symbol when dividing by a negative number is the rule that separates the correct answer from its mirror distractor.
8. C — $x = 3$. Evaluating gives $f(3) = 2(3) + 2 = 8$ and $g(3) = 2^3 = 8$, so the two functions produce equal outputs at $x = 3$. The point where two graphs intersect is the input value at which their outputs match.

9. B — $8x^2 + 2x - 2$. Combining like terms gives $(5x^2 + 3x^2) + (-2x + 4x) + (7 - 9) = 8x^2 + 2x - 2$. Adding the corresponding terms of two polynomials produces a single polynomial of the same form.
10. A — $(x + 3)^2 = 20$. Moving the constant gives $x^2 + 6x = 11$; adding $(6/2)^2 = 9$ to both sides yields $x^2 + 6x + 9 = 20$, which factors as $(x + 3)^2 = 20$. Completing the square requires adding the square of half the linear coefficient to both sides.
11. C — -4. The predicted value is $-1.2(10) + 30 = 18$, and the residual is observed minus predicted: $14 - 18 = -4$. A negative residual means the actual data point lies below the line of best fit.
12. D — $(x - 4)(x - 7)$. The factors must multiply to 28 and add to -11, which -4 and -7 satisfy. Both factors carry minus signs because the product is positive while the sum is negative.
13. B — 85. With equal weighting, the mean is $(90 + 90 + 75)/3 = 255/3 = 85$. An equally weighted mean sums the values and divides by the count, regardless of which scores are repeated.
14. A — $C = 0.25m + 40$. The total cost is the fixed daily charge of \$40 plus \$0.25 multiplied by the miles driven. Modeling a fixed fee as a constant and a per-unit cost as a coefficient on the variable produces the correct linear equation.
15. C — 4. The fifth term of a geometric sequence is $a_1 \cdot r^4 = 64 \cdot (1/2)^4 = 64 \cdot (1/16) = 4$. Each term multiplies the previous one by the common ratio, so the exponent is one less than the term number.
16. D — $x = -1$. The axis of symmetry of a parabola is the vertical line through its vertex, and the vertex is at $(-1, 5)$, giving $x = -1$. The axis is always written as x equals the x-coordinate of the vertex.
17. B — 5. The average rate of change is $(f(4) - f(1))/(4 - 1) = (19 - 4)/3 = 15/3 = 5$. For a nonlinear function this represents the slope of the secant line between the two endpoints, not a constant rate.
18. A — As $x \to \infty$, $f(x) \to 0$; as $x \to -\infty$, $f(x) \to \infty$. With base 1/2, the function decays toward 0 as x grows large and grows toward infinity as x decreases. A base between 0 and 1 produces exponential decay, opposite to the behavior of a base greater than 1.
19. D — 11 inches. The side of a square is the square root of its area, so $\sqrt{121} = 11$ inches. A square's area equals the side length squared, and inverting that relationship gives the side as a square root.
20. C — The initial amount of water in the pool. $V(0) = 8(0) + 50 = 50$, the volume present when $t = 0$ before any water is added. The y-intercept of a linear context represents the starting value before time elapses.
21. B — $x = 3$ and $x = -7/2$. Setting each factor equal to zero gives $x - 3 = 0$, so $x = 3$, and $2x + 7 = 0$, so $x = -7/2$. The zero-product property states that if a product is zero, at least one factor must be zero.
22. D — 32. Adding the frequencies for [300, 400), [400, 500), and [500, 600) gives $18 + 10 + 4 = 32$ books. Reading the frequencies for the relevant intervals and summing them answers cumulative-frequency questions.
23. A — $y = (2/3)x - 4$. Slope-intercept form $y = mx + b$ uses $m = 2/3$ and $b = -4$, producing $y = (2/3)x - 4$. The slope is the coefficient of x, and the constant term is the y-intercept.

24. C — $y = -4x + 5$. Parallel lines share the same slope, so the new line uses slope -4 and passes through $(0, 5)$, giving $y = -4x + 5$. Two lines are parallel exactly when their slopes are equal but their intercepts differ.
25. B — $f(x) = (x - 2)^2 - 3$. Completing the square on $x^2 - 4x$ gives $(x - 2)^2 - 4$, and adding the original constant 1 produces $(x - 2)^2 - 3$. Vertex form $a(x - h)^2 + k$ reveals the vertex (h, k) directly, here $(2, -3)$.
26. D — 28. Letting the integers be n and $n + 2$, the sum $n + (n + 2) = 54$ gives $2n = 52$, so $n = 26$ and the larger integer is 28. Consecutive even integers differ by 2, which determines the algebraic setup.
27. A — Exponential decay. A cooling object approaches room temperature asymptotically, with its temperature difference shrinking by a constant percentage over time. Newton's law of cooling produces exponential decay toward an ambient value rather than linear change.
28. C — Exactly one. Two lines with different slopes intersect at a single point. An inconsistent system has no solution and a dependent system has infinitely many, so a single intersection signals exactly one solution.
29. D — 2/5. The probability is favorable outcomes over total outcomes: 4 blue out of 10 total, which simplifies to 2/5. Reducing the fraction by the greatest common factor expresses the probability in lowest terms.
30. B — A minimum, because the leading coefficient is positive. The leading coefficient 2 is positive, so the parabola opens upward and the vertex is the lowest point. An upward-opening parabola always has a minimum, never a maximum.
31. A — $y = -4x - 5$. The perpendicular slope is the negative reciprocal of $1/4$, which is -4; using $(-2, 3)$ gives $3 = -4(-2) + b$, so $b = -5$. Perpendicular slopes multiply to -1, which determines the new slope before the point fixes the intercept.
32. C — A unit increase in x is associated with about a 5-unit increase in y. The slope of a linear model represents the predicted change in y per one-unit change in x. A strong association still cannot establish causation, and a correlation of exactly 1 would require a perfect fit.
33. B — The data set likely contains a few low outliers pulling the mean down. A mean smaller than the median indicates left-skewed data, where small extreme values reduce the average while leaving the middle position relatively unaffected. The relationship between mean and median reveals the skew of a distribution.
34. D — $f(x)$ is exponential; $g(x)$ is linear. The values of f triple from 1 to 3 to 9 to 27 to 81, indicating a constant ratio of 3, while g increases by 2 each step, indicating a constant difference. A common ratio defines exponential behavior and a common difference defines linear behavior.
35. A — The depth decreases by 0.05 ft per horizontal foot. The slope -0.05 is the rate of change of depth with respect to horizontal distance, and the negative sign indicates a decrease. A negative slope models a quantity that drops as the input increases.