PRACTICE EXAM 36

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: $8 - 2(x - 3) = 4x + 2$.

A. $x = 1$

B. $x = 2$

C. $x = 3$

D. $x = 4$

2. A function is defined by $f(x) = -x^2 + 5x - 4$. What is the value of $f(2)$?

A. -2

B. -4

C. 6

D. 2

3. Which equation has roots of $x = 3$ and $x = -4$?

A. $x^2 + x - 12 = 0$

B. $x^2 - x - 12 = 0$

C. $x^2 + 7x + 12 = 0$

D. $x^2 - 7x - 12 = 0$

4. Solve for x: $4x - 7 < 9$.

A. $x > 4$

B. $x \leq 4$

C. $x < 4$

D. $x \geq 4$

5. The first five terms of an arithmetic sequence are 3, 8, 13, 18, 23. Which is the explicit formula for the nth term?

A. $a_n = 5 + 3(n - 1)$

B. $a_n = 3(5)$^$(n - 1)$

C. $a_n = 3 + 5(n - 1)$

D. $a_n = 5n + 3$

6. Which is the completely factored form of $x^2 + 9x + 20$?

A. $(x + 4)(x + 5)$

B. $(x - 4)(x - 5)$

C. $(x + 10)(x + 2)$

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

7. A population grows at 8% per year starting from 5,000 people. Which function models the population after t years?

A. $P(t) = 5000(0.08)$^t

B. $P(t) = 5000 + 0.08t$

C. $P(t) = 5000(0.92)^t$

D. $P(t) = 5000(1.08)^t$

8. What is the solution to the system $2x + y = 10$ and $x - y = 2$?

A. (2, 6)

B. (4, 2)

C. (3, 4)

D. (5, 0)

9. What is the slope of the line passing through (1, 5) and (5, −3)?

A. −2

B. 2

C. −1/2

D. 1/2

10. What are the solutions to the equation $x^2 - 49 = 0$?

A. $x = 7$ only

B. $x = \pm 49$

C. $x = \pm 7$

D. $x = \pm\sqrt{7}$

11. A line has a slope of 3 and a y-intercept of −5. Which equation expresses this line in standard form?

A. $3x + y = -5$

B. $3x - y = 5$

C. $-3x + y = 5$

D. $3x - y = -5$

12. Which expression is equivalent to $(x + 4)(x - 6)$?

A. $x^2 + 2x - 24$

B. $x^2 - 2x + 24$

C. $x^2 + 10x - 24$

D. $x^2 - 2x - 24$

13. The mean of the five values 8, 12, 15, x, and 20 is 14. What is the value of x?

A. 15

B. 14

C. 12

D. 10

14. A bag contains 8 red, 4 blue, and 8 green marbles. What is the probability of drawing a blue marble at random?

A. 1/4

B. 4/16

C. 4/8

D. 1/5

15. A function is defined by $f(x) = 2(0.5)^x$. What is the value of f(3)?

A. 8

B. 3

C. 1/4

D. 6

16. Convert $y = -2x + 6$ to standard form with a positive leading coefficient.

A. $-2x + y = 6$

B. $2x + y = 6$

C. $2x - y = 6$

D. $-2x - y = 6$

17. Solve for x: $x/4 + 3 = 7$.

A. $x = 1$

B. $x = 4$

C. $x = 16$

D. $x = 10$

18. A car valued at $20,000 depreciates at a rate of 10% per year. What is its value after 2 years?

A. $16,200

B. $18,000

C. $16,000

D. $18,200

19. What is the vertex of the parabola $y = (x - 3)^2 + 5$?

A. (−3, −5)

B. (−3, 5)

C. (3, −5)

D. (3, 5)

20. A geometric sequence has a first term of 4 and a common ratio of 1/2. What is the fourth term?

A. 2

B. 1/2

C. 1

D. 1/4

21. Solve for x: $2(x + 3) = 4x - 8$.

A. $x = 1$

B. $x = 5$

C. $x = 7$

D. $x = -7$

22. Which expression is equivalent to $(3x^2)(4x^5)$?

A. $12x^7$

B. $12x^{10}$

C. $7x^7$

D. $12x^3$

23. A function is defined by $f(x) = 3x + 1$. If $f(a) = 10$, what is the value of a?

A. a = 2

B. a = 3

C. a = 4

D. a = 1

24. The product of two consecutive positive integers is 56. What is the smaller integer?

A. 6

B. 8

C. 5

D. 7

25. Which expression is equivalent to x^8/x^3?

A. x^5

B. x^{11}

C. $x^{2.67}$

D. x^{24}

26. A car travels at a constant speed of 65 mph. How far does it travel in 4.5 hours?

A. 260 miles

B. 270 miles

C. 292.5 miles

D. 325 miles

27. What are the solutions to the equation $x^2 + 2x - 8 = 0$?

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

B. $x = -4$ and $x = 2$

C. $x = -4$ and $x = -2$

D. $x = 4$ and $x = 2$

28. A line passes through the points $(0, -3)$ and $(2, 5)$. What is the slope of the line?

A. -4

B. 1/4

C. 2

D. 4

29. Which inequality represents "twice a number decreased by 5 is at least 9"?

A. $2x - 5 \leq 9$

B. $2x - 5 > 9$

C. $2x - 5 \geq 9$

D. $2x + 5 \geq 9$

30. A line is perpendicular to $y = (1/3)x + 2$ and passes through the point (0, 5). Which equation represents this line?

A. $y = -3x + 5$

B. $y = (1/3)x + 5$

C. $y = 3x + 5$

D. $y = -(1/3)x + 5$

31. What is the median of the data set 4, 9, 7, 12, 15, 8, 11?

A. 8

B. 11

C. 10

D. 9

32. What are the solutions to the equation $|x - 4| = 6$?

A. $x = 10$ only

B. $x = 10$ and $x = -2$

C. $x = -10$ and $x = 2$

D. $x = -2$ only

33. A right triangle has legs of length 5 and 12. What is the length of the hypotenuse?

A. 13

B. 17

C. 15

D. 11

34. Which expression converts $y = x^2 + 6x + 5$ to vertex form?

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

B. $y = (x + 3)^2 + 4$

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

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

35. What is the y-intercept of the function f(x) = 5(2)^x?

A. (0, 2)

B. (0, 5)

C. (0, 10)

D. (0, 0)

ANSWER KEY WITH EXPLANATIONS – PRACTICE EXAM 36

1. B — $x = 2$. Distributing gives $8 - 2x + 6 = 4x + 2$, which simplifies to $14 - 2x = 4x + 2$, and isolating x yields $6x = 12$, so $x = 2$. Distributing carefully before combining like terms is essential when a negative coefficient is attached to a parenthetical expression.
2. D — 2. Substituting $x = 2$ gives $-(2)^2 + 5(2) - 4 = -4 + 10 - 4 = 2$. Applying the negative sign only after squaring the input prevents the sign error behind the −2 distractor.
3. A — $x^2 + x - 12 = 0$. Roots of 3 and −4 correspond to factors $(x - 3)(x + 4)$, and expanding gives $x^2 + x - 12$. Each root r contributes a factor $(x - r)$, so the sum and product of the roots determine the middle and constant terms.
4. C — $x < 4$. Adding 7 to both sides gives $4x < 16$, and dividing by 4 yields $x < 4$. Dividing by a positive number preserves the direction of the inequality.
5. C — $a_n = 3 + 5(n - 1)$. The first term is 3 and the common difference is 5, matching the standard arithmetic formula $a_1 + d(n - 1)$. The first term must serve as the starting value and the difference as the multiplier on $(n - 1)$, not the reverse.
6. A — $(x + 4)(x + 5)$. The factors must multiply to 20 and add to 9, which 4 and 5 satisfy. Both signs are positive because the product and sum are both positive.
7. D — $P(t) = 5000(1.08)^t$. An 8% annual increase multiplies by $1 + 0.08 = 1.08$ each year, applied to the initial value of 5,000. Exponential growth uses a base greater than 1, separating it from a linear additive model.
8. B — (4, 2). Adding the equations eliminates y to give $3x = 12$, so $x = 4$, and substituting into $x - y = 2$ gives $y = 2$. Elimination works cleanly when the y-coefficients are already opposites.
9. A — −2. The slope is $(-3 - 5)/(5 - 1) = -8/4 = -2$. Keeping the coordinates in matching order in numerator and denominator prevents the sign error that produces the positive distractor.
10. C — $x = \pm 7$. Solving $x^2 = 49$ yields $x = \pm\sqrt{49} = \pm 7$, both of which satisfy the original equation. A quadratic of this form always has two real solutions, equal in magnitude but opposite in sign.
11. B — $3x - y = 5$. From $y = 3x - 5$, subtracting y from both sides and rearranging gives $3x - y = 5$. Standard form requires a positive leading coefficient and integer terms, both achieved here.
12. D — $x^2 - 2x - 24$. Using FOIL gives $x^2 - 6x + 4x - 24$, and combining like terms produces $x^2 - 2x - 24$. The cross terms $-6x$ and $+4x$ do not cancel completely, leaving a negative middle term.
13. A — 15. A mean of 14 across five values requires a total of 70, and the four known values sum to 55, so $x = 70 - 55 = 15$. The mean fixes the total, allowing a missing value to be found by subtraction.
14. D — 1/5. The probability is favorable outcomes over total outcomes: 4 blue out of 20 total, which simplifies to 1/5. Reducing the fraction by the greatest common factor expresses the probability in lowest terms.
15. C — 1/4. Substituting gives $f(3) = 2(0.5)^3 = 2(1/8) = 1/4$. A base between 0 and 1 raised to a positive exponent produces a value smaller than the base, reflecting exponential decay.

16. B — $2x + y = 6$. From $y = -2x + 6$, adding $2x$ to both sides gives $2x + y = 6$. Standard form requires a positive leading coefficient, which determined the sign of the x-term.
17. C — $x = 16$. Subtracting 3 gives $x/4 = 4$, and multiplying both sides by 4 yields $x = 16$. Reversing the order of operations isolates the variable in a one-variable linear equation.
18. A — $16,200. Each year the car retains 90% of its value, so after 2 years the value is $20000(0.9)^2 = 20000(0.81) = 16{,}200$. Exponential decay applies the retention factor once per period rather than subtracting a flat amount.
19. D — (3, 5). In vertex form $a(x - h)^2 + k$, the vertex is (h, k), giving (3, 5). The sign attached to h flips inside the parentheses, so the subtraction sign indicates a positive x-coordinate.
20. B — 1/2. The terms are 4, 2, 1, 1/2, with each successive term half the previous. Multiplying by the common ratio three times moves from the first term to the fourth term.
21. C — $x = 7$. Distributing gives $2x + 6 = 4x - 8$, and isolating x yields $2x = 14$, so $x = 7$. Collecting variables on one side and constants on the other is the standard procedure for linear equations.
22. A — $12x^7$. Multiplying coefficients gives $3 \times 4 = 12$, and the product of powers rule $x^2 \cdot x^5 = x^7$ gives the variable part. Multiplying like bases adds the exponents rather than multiplying them.
23. B — $a = 3$. Setting $3a + 1 = 10$ gives $3a = 9$, so $a = 3$. Solving f(a) equal to a target value reverses the function's operations to recover the input.
24. D — 7. Two consecutive integers n and n + 1 with product 56 satisfy $n^2 + n - 56 = 0$, which factors to $(n - 7)(n + 8) = 0$; the positive solution is $n = 7$. Confirming $7 \times 8 = 56$ verifies the smaller of the two consecutive integers.
25. A — x^5. The quotient rule for exponents subtracts the powers when dividing like bases: $x^{(8 - 3)} = x^5$. Subtracting exponents on division mirrors adding them on multiplication.
26. C — 292.5 miles. Distance equals rate times time, so $65 \times 4.5 = 292.5$ miles. A constant speed produces a linear relationship between distance and elapsed time.
27. B — $x = -4$ and $x = 2$. Factoring $x^2 + 2x - 8$ gives $(x + 4)(x - 2) = 0$, so $x = -4$ or $x = 2$. The factors must multiply to −8 and add to 2, which 4 and −2 satisfy.
28. D — 4. The slope is $(5 - (-3))/(2 - 0) = 8/2 = 4$. The change in y over the change in x gives the slope between any two points on a line.
29. C — $2x - 5 \geq 9$. "Twice a number" translates to 2x, "decreased by 5" subtracts 5, and "at least 9" uses ≥. Each verbal phrase maps to a specific algebraic symbol, with "at least" indicating inclusion of the boundary value.
30. A — $y = -3x + 5$. The perpendicular slope is the negative reciprocal of 1/3, which is −3, and the y-intercept is 5, giving $y = -3x + 5$. Perpendicular slopes multiply to −1, which uniquely determines the new slope.
31. D — 9. Ordering the data gives 4, 7, 8, 9, 11, 12, 15, with the middle value 9. The median of an odd-sized data set is the single value at the center of the ordered list.
32. B — $x = 10$ and $x = -2$. The absolute-value equation splits into $x - 4 = 6$, giving $x = 10$, and $x - 4 = -6$, giving $x = -2$. Two solutions arise because both a quantity and its opposite share the same distance from zero.
33. A — 13. The Pythagorean theorem gives $c^2 = 5^2 + 12^2 = 25 + 144 = 169$, so $c = 13$. The hypotenuse is always the longest side of a right triangle and is recovered by taking the square root of the sum of squared legs.
34. C — $y = (x + 3)^2 - 4$. Completing the square on $x^2 + 6x$ adds and subtracts 9, giving $(x + 3)^2 - 9 + 5 = (x + 3)^2 - 4$. Vertex form reveals the vertex (−3, −4) directly from the equation.

35. B — (0, 5). At x = 0, $f(0) = 5(2)^0 = 5(1) = 5$. Any nonzero base raised to the zero power equals 1, so the coefficient alone determines the y-intercept of a basic exponential function.