PRACTICE EXAM 38

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. The variable y varies directly with x. When x = 4, y = 12. What is the value of y when x = 9?

A. y = 21

B. y = 36

C. y = 24

D. y = 27

2. Solve for x: (x + 4)/3 = 5.

A. x = 9

B. $x = 11$

C. $x = 1$

D. $x = 19$

3. Which expression is equivalent to $(4x^2 - 3x + 7) - (2x^2 + 5x - 4)$?

A. $2x^2 + 2x + 3$

B. $6x^2 - 8x + 11$

C. $2x^2 - 8x + 11$

D. $2x^2 - 8x + 3$

4. Solve the equation $\sqrt{(x + 5)} = 4$ for x.

A. $x = 11$

B. $x = 21$

C. $x = -1$

D. $x = 9$

5. The graph of $g(x) = x^2 + 5$ is the graph of $f(x) = x^2$ shifted in which direction?

A. Down 5 units

B. Right 5 units

C. Left 5 units

D. Up 5 units

6. A function is defined by $f(x) = 2x - 1$. What is the value of $f(f(3))$?

A. 5

B. 9

C. 7

D. 11

7. Solve for x: $3x + 5 = 2(x - 1) + 12$.

A. $x = 5$

B. $x = -5$

C. $x = 7$

D. $x = 15$

8. A bag contains 5 red, 3 blue, and 2 green marbles. What is the probability of drawing a marble that is not blue?

A. 3/10

B. 1/3

C. 7/10

D. 2/10

9. What is the slope of the line passing through the points (−1, 4) and (3, −8)?

A. 3

B. 1/3

C. −1/3

D. −3

10. A line has the equation $y - 2 = 3(x + 4)$. Which is the slope-intercept form of this line?

A. $y = 3x - 14$

B. $y = 3x + 14$

C. $y = 3x + 2$

D. $y = -3x - 14$

11. What is the minimum value of $f(x) = x^2 - 4x + 7$?

A. 3

B. 7

C. −3

D. −7

12. A rectangle has width x and length $3x + 2$, with area 56 square units. Which equation models this situation?

A. $3x + 2 = 56$

B. $3x^2 - 2x + 56 = 0$

C. $3x^2 + 2x - 56 = 0$

D. $3x^2 + 2x + 56 = 0$

13. The sum of three consecutive integers is 78. What is the middle integer?

A. 25

B. 26

C. 27

D. 28

14. A bacteria culture doubles every 3 hours, starting at 100 bacteria. Which function models the count N after t hours?

A. $N(t) = 100(2)^{(3t)}$

B. $N(t) = 100 + 2t$

C. $N(t) = 100(3)^{(t/2)}$

D. $N(t) = 100(2)^{(t/3)}$

15. What is the y-intercept of the function $f(x) = 3x^2 - 4x + 7$?

A. (0, 7)

B. (0, 3)

C. (0, −4)

D. (0, 0)

16. Which is the completely factored form of $x^2 - 5x - 24$?

A. $(x + 8)(x - 3)$

B. $(x - 6)(x + 4)$

C. $(x - 8)(x + 3)$

D. $(x - 12)(x + 2)$

17. A function is defined by $f(x) = 3x + 5$. For what value of x does $f(x) = 26$?

A. $x = 5$

B. $x = 7$

C. $x = 83$

D. $x = 21$

18. Which form is the standard form of a linear equation?

A. $y = mx + b$

B. $x + y$ equals a constant

C. $y - y_1 = m(x - x_1)$

D. $Ax + By = C$

19. Two trains leave the same station at the same time and travel in opposite directions. One train travels at 60 mph and the other at 80 mph. After how many hours are the trains 350 miles apart?

A. 2.5 hours

B. 3 hours

C. 4 hours

D. 5 hours

20. The function $f(x) = -2x^2 + 8x - 3$ has a maximum value at which point?

A. $(2, -3)$

B. $(-2, 5)$

C. (2, 5)

D. (4, 5)

21. A line passes through the point (0, −3) and has a slope of −2. What is the x-intercept of this line?

A. (3/2, 0)

B. (−3/2, 0)

C. (3, 0)

D. (−3, 0)

22. What expression is equivalent to $(x^3)^4$?

A. x^{12}

B. x^7

C. x^{81}

D. $4x^3$

23. The mean of the values 14, 18, 22, x, and 30 is 23. What is the value of x?

A. x = 23

B. x = 25

C. x = 28

D. x = 31

24. A fair coin is tossed twice. What is the probability of getting at least one head?

A. 1/4

B. 1/2

C. 3/4

D. 1

25. If 3^x = 27, what is the value of x?

A. x = 3

B. x = 9

C. x = 27

D. $x = 1/3$

26. What are the solutions to the equation $2x^2 - 7x + 3 = 0$?

A. $x = 2$ and $x = 3$

B. $x = 1/2$ and $x = 3$

C. $x = -1/2$ and $x = -3$

D. $x = 1$ and $x = 3$

27. In a survey, 75% of students prefer pizza, 60% prefer burgers, and 50% prefer both. What percent of students prefer neither?

A. 5%

B. 10%

C. 15%

D. 25%

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

A. $2x + 10$

B. $6x + 11$

C. $2x + 11$

D. $2x + 14$

29. What is the average rate of change of $f(x) = x^2 + 2x$ on the interval from $x = 1$ to $x = 4$?

A. 21

B. 7

C. 5

D. 3

30. A scatter plot shows a strong, positive linear relationship between hours of practice and test scores. Which value of the correlation coefficient is most likely?

A. $r = 0.95$

B. $r = -0.95$

C. $r = 0.05$

D. $r = 0$

31. What is the slope of the line represented by the equation $6x - 2y = 8$?

A. −3

B. 6

C. 3

D. −6

32. A right triangle has a hypotenuse of length 26 and one leg of length 10. What is the length of the other leg?

A. 16

B. 18

C. 22

D. 24

33. Which expression represents the phrase "twice the sum of a number and 7"?

A. $2x + 7$

B. $2(x + 7)$

C. $7x + 2$

D. $2(7x)$

34. Solve the system of equations $x + y = 12$ and $x - y = 4$.

A. (8, 4)

B. (4, 8)

C. (6, 6)

D. (10, 2)

35. A relation contains the ordered pairs {(1, 2), (3, 4), (5, 6), (3, 8)}. Is the relation a function, and why or why not?

A. Yes, each input maps to one output

B. Yes, all values are positive integers

C. No, the outputs are not consecutive numbers

D. No, the input 3 maps to two different outputs

ANSWER KEY WITH EXPLANATIONS – PRACTICE EXAM 38

1. D — $y = 27$. Direct variation gives $y = kx$; substituting (4, 12) yields $k = 3$, and then $y = 3(9) = 27$. The constant of variation is fixed by one known pair and applied to any other input.
2. B — $x = 11$. Multiplying both sides by 3 gives $x + 4 = 15$, and subtracting 4 yields $x = 11$. Clearing the denominator first turns a fractional equation into a routine linear one.
3. C — $2x^2 - 8x + 11$. Distributing the subtraction gives $4x^2 - 3x + 7 - 2x^2 - 5x + 4$, and combining like terms produces $2x^2 - 8x + 11$. Applying the negative sign to every term inside the second parentheses prevents the sign-error distractors.
4. A — $x = 11$. Squaring both sides of $\sqrt{x + 5} = 4$ gives $x + 5 = 16$, so $x = 11$. Squaring is the inverse operation of taking a square root, isolating the variable inside the radical.
5. D — Up 5 units. Adding a positive constant outside the squared term shifts the parabola upward by that constant. Outside-the-function additions affect vertical position, while inside-the-function changes affect horizontal position.
6. B — 9. Inside-out composition gives $f(3) = 5$, and then $f(5) = 2(5) - 1 = 9$. Function composition applies the inner function first, then feeds its output into the outer function.
7. A — $x = 5$. Distributing gives $3x + 5 = 2x - 2 + 12$, which simplifies to $3x + 5 = 2x + 10$, and isolating x yields $x = 5$. Collecting variables on one side and constants on the other is the standard procedure for multi-step linear equations.
8. C — 7/10. The non-blue marbles total 5 red + 2 green = 7 out of 10, giving 7/10. The complement of P(blue) = 3/10 is 1 − 3/10 = 7/10.
9. D — −3. The slope is $(-8 - 4)/(3 - (-1)) = -12/4 = -3$. Keeping the coordinates in matching order in numerator and denominator prevents sign errors.
10. B — $y = 3x + 14$. Distributing gives $y - 2 = 3x + 12$, and adding 2 to both sides yields $y = 3x + 14$. Converting point-slope form to slope-intercept form requires only distribution and isolation of y.
11. A — 3. The vertex x-coordinate is $-b/(2a) = 4/2 = 2$, and substituting gives $4 - 8 + 7 = 3$. For an upward-opening parabola, the vertex y-coordinate is the minimum output of the function.
12. C — $3x^2 + 2x - 56 = 0$. Area equals length times width: $x(3x + 2) = 56$ expands to $3x^2 + 2x = 56$, then rearranges to $3x^2 + 2x - 56 = 0$. Setting one side to zero produces the standard quadratic form for solving.
13. B — 26. Letting the middle integer be n, the sum $(n - 1) + n + (n + 1) = 3n$ equals 78, so $n = 26$. Centering the variable on the middle of consecutive integers makes the equation symmetric and the unknown directly visible.
14. D — $N(t) = 100(2)^{(t/3)}$. The population doubles for each 3-hour period, so the exponent is t divided by the doubling time. Dividing time by the period of doubling counts how many doubling intervals have elapsed.
15. A — (0, 7). At $x = 0$, $f(0) = 3(0)^2 - 4(0) + 7 = 7$. The y-intercept of any polynomial function is simply its constant term.
16. C — $(x - 8)(x + 3)$. The factors must multiply to −24 and add to −5, which −8 and 3 satisfy. The opposite signs reflect a negative product, and the larger magnitude on the negative factor produces the negative sum.

17. B — $x = 7$. Setting $3x + 5 = 26$ gives $3x = 21$, so $x = 7$. Solving $f(x)$ equal to a target output reverses the function's operations to recover the input.
18. D — $Ax + By = C$. The standard form of a linear equation places both variable terms on the left side equal to a constant on the right. This form makes intercepts and integer relationships easy to read off.
19. A — 2.5 hours. The trains move apart at a combined rate of $60 + 80 = 140$ mph, so 350 miles ÷ 140 mph = 2.5 hours. When two objects move in opposite directions, the rate of separation is the sum of their individual speeds.
20. C — (2, 5). The vertex x-coordinate is $-b/(2a) = -8/(2\cdot-2) = 2$, and substituting gives $-2(4) + 8(2) - 3 = -8 + 16 - 3 = 5$. For a downward-opening parabola, the vertex marks the maximum value.
21. B — (−3/2, 0). Using $y = -2x - 3$ and setting $y = 0$ gives $0 = -2x - 3$, so $x = -3/2$. The x-intercept occurs where the function output equals zero.
22. A — x^{12}. The power-of-a-power rule multiplies exponents: $(x^3)^4 = x^{(3\cdot4)} = x^{12}$. Raising a power to a power multiplies the exponents, distinguishing it from the product rule that adds them.
23. D — $x = 31$. A mean of 23 across five values requires a total of 115, and the four known values sum to 84, so $x = 115 - 84 = 31$. The mean determines the total, which then locates any missing value by subtraction.
24. C — 3/4. The probability of no heads in two tosses is $(1/2)^2 = 1/4$, and the complement is $1 - 1/4 = 3/4$. The probability of at least one event is most efficiently found as one minus the probability of none.
25. A — $x = 3$. Rewriting 27 as 3^3 gives $3^x = 3^3$, so $x = 3$. When the bases are equal, the exponents must be equal.
26. B — $x = 1/2$ and $x = 3$. Factoring gives $(2x - 1)(x - 3) = 0$, so $2x - 1 = 0$ or $x - 3 = 0$, yielding $x = 1/2$ or $x = 3$. Setting each factor to zero applies the zero-product property.
27. C — 15%. By inclusion–exclusion, the percent preferring pizza or burgers is $75 + 60 - 50 = 85\%$, so the percent preferring neither is $100 - 85 = 15\%$. Subtracting the overlap once corrects for double-counting students who chose both.
28. D — $2x + 14$. Distributing gives $4x + 12 - 2x + 2$, and combining like terms produces $2x + 14$. Applying the negative sign to every term inside the second parentheses prevents sign-error distractors.
29. B — 7. Computing the endpoints, $f(1) = 3$ and $f(4) = 24$, gives an average rate of change of $(24 - 3)/(4 - 1) = 21/3 = 7$. For a nonlinear function this represents the slope of the secant line between the two endpoints.
30. A — $r = 0.95$. A strong positive linear relationship produces a correlation coefficient close to +1. The magnitude near 1 indicates strength, and the positive sign indicates an upward direction.
31. C — 3. Isolating y in $6x - 2y = 8$ gives $-2y = -6x + 8$, so $y = 3x - 4$, revealing a slope of 3. Converting standard form to slope-intercept form exposes the coefficient of x as the slope.
32. D — 24. The Pythagorean theorem gives $leg^2 = 26^2 - 10^2 = 676 - 100 = 576$, so the leg is $\sqrt{576} = 24$. The square of the hypotenuse equals the sum of the squares of the legs, which can be rearranged to find a missing leg.

33. B — 2(x + 7). "Sum of a number and 7" gives (x + 7), and "twice" doubles that quantity, producing 2(x + 7). The placement of parentheses captures the order of operations specified by the verbal phrase.
34. A — (8, 4). Adding the equations eliminates y to give 2x = 16, so x = 8, and substituting gives 8 + y = 12, so y = 4. Elimination works cleanly when the y-coefficients are already opposites.
35. D — No, the input 3 maps to two different outputs. The ordered pairs (3, 4) and (3, 8) share the same input value but produce different outputs, which violates the definition of a function. A function requires each input to be paired with exactly one output.