# PRACTICE EXAM 46:NY REGENTS ALGEBRA I SIMULATION — 35 QUESTIONS

**Recommended Time: 3 Hours**

**Required Tools: Graphing Calculator, Straightedge**

Directions: Answer all 35 questions. For Part I, record answers on your answer sheet. For Parts II, III, and IV, show all work in the space provided. Partial credit is available on Parts II–IV.

**PART I — Multiple Choice (Questions 1–24)**

**Each correct answer is worth 2 credits. No partial credit. No penalty for guessing.**

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

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

B. $h = Ab/2$

C. $h = 2A/b$

D. $h = A - 2b$

2. If $f(x) = -3x + 5$, what is the value of $f(-2)$?

A. $f(-2) = -1$

B. $f(-2) = 11$

C. $f(-2) = -11$

D. $f(-2) = 1$

3. What is the slope of the line $4x - 2y = 8$?

A. 4

B. −2

C. −4

D. 2

4. Which expression is the factored form of $x^2 + 10x + 25$?

A. $(x + 5)^2$

B. $(x - 5)^2$

C. $(x + 5)(x - 5)$

D. $(x + 25)(x + 1)$

5. A house valued at $250,000 appreciates 3% per year. Which function gives its value after t years?

A. V(t) = 250000(0.03)^t

B. V(t) = 250000(0.97)^t

C. $V(t) = 250000(1.03)^t$

D. $V(t) = 250000 + 0.03t$

6. What are the solutions to the equation $x^2 - 2x - 24 = 0$?

A. $x = 6$ and $x = -4$

B. $x = -6$ and $x = 4$

C. $x = 6$ and $x = 4$

D. $x = -6$ and $x = -4$

7. Which explicit formula represents the sequence 12, 9, 6, 3, …?

A. $a_n = 12 + 3(n - 1)$

B. $a_n = 12 - 3(n - 1)$

C. $a_n = -3 + 12(n - 1)$

D. $a_n = 12(-3)^{(n - 1)}$

8. A delivery van can carry no more than 1,200 pounds. Each box weighs 40 pounds, and the driver weighs 180 pounds. Which inequality represents the number of boxes b the van can carry?

A. $b \leq 30$

B. $b \geq 25.5$

C. $b \leq 34.5$

D. $b \leq 25.5$

9. What does the solution to a system of two linear equations represent on a graph?

A. the y-intercepts of both lines

B. the slopes of both lines

C. the point where the two lines intersect

D. the midpoint between the two lines

10. The table below shows values of a function.

x: 0, 1, 2, 3

y: 4, 12, 36, 108

Which type of function is represented?

A. Exponential, with a common ratio of 3

B. Linear, with a rate of change of 8

C. Quadratic, with constant second differences

D. Exponential, with a common ratio of 4

11. Which expression is equivalent to $-2x(3x - 5)$?

A. $-6x^2 - 10x$

B. $6x^2 - 10x$

C. $-6x^2 - 5$

D. $-6x^2 + 10x$

12. Which statement best describes the transformation from $f(x) = x^2$ to $g(x) = (x + 6)^2$?

A. The graph of f(x) is shifted horizontally right 6 units

B. The graph of f(x) is shifted horizontally left 6 units

C. The graph of f(x) is shifted vertically up 6 units

D. The graph of f(x) is shifted vertically down 6 units

13. A linear function passes through the points (0, −3) and (2, 5). What is its equation?

A. $y = 4x + 3$

B. $y = 2x - 3$

C. $y = 4x - 3$

D. $y = -4x - 3$

14. What is the maximum value of $f(x) = -x^2 + 6x - 5$?

A. $f = 4$

B. $f = 3$

C. f = −5

D. f = 9

15. Which of the following numbers is irrational?

A. 0.75

B. √10

C. 4/5

D. √25

16. What is the median of the data set 5, 9, 12, 14, 18, 22?

A. median = 12

B. median = 14

C. median = 12.5

D. median = 13

17. A survey of 80 people recorded preference for tea or coffee by age group.

| | Tea | Coffee | Total |
|---|---|---|---|
| Under 30: | 10 | 30 | 40 |
| 30 or older: | 25 | 15 | 40 |
| Total: | 35 | 45 | 80 |

What percent of the surveyed people who are under 30 prefer coffee?

A. 75%

B. 30%

C. 37.5%

D. 66.7%

18. A line of best fit predicts $\hat{y} = 3x + 10$, and a data point (4, 25) is observed. Which statement is true about the residual?

A. The residual is −3, so the point is below the line

B. The residual is 0, so the point is on the line

C. The residual is 3, so the point is above the line

D. The residual is 25, so the line fits the point poorly

19. Which system of equations has infinitely many solutions?

A. $y = 5x + 2$ and $y = 5x - 2$

B. $y = 2x + 6$ and $2y = 4x + 12$

C. $y = x + 1$ and $y = -x + 1$

D. $y = 3x$ and $y = 3x + 9$

20. What is the average rate of change of $f(x) = x^2 - 4$ over the interval $0 \leq x \leq 4$?

A. 16

B. 12

C. 3

D. 4

21. A car's value is modeled by $V(t) = 18000(0.85)^t$. By what percent does the value decrease each year?

A. 15%

B. 85%

C. 0.85%

D. 8.5%

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

A. no real solutions

B. exactly one real solution

C. two real solutions

D. it cannot be determined

23. A function models the height of water in a draining tank, $h(t) = 80 - 4t$, where t is time in minutes and h is the height in inches. What is the most appropriate domain for this situation?

A. all real numbers, since t can be any value

B. $t \geq 0$, with no upper limit on the time

C. $-20 \leq t \leq 20$, centered on the start

D. $0 \leq t \leq 20$, until the tank empties

24. Two phone plans are modeled by $C(x) = 0.10x + 20$ and $D(x) = 0.05x + 35$, where x is the number of minutes. Which statement is true?

A. Plan C has a lower per-minute rate than Plan D

B. Plan C charges more per minute but has a lower base fee than Plan D

C. Both plans charge the same amount per minute

D. Plan D has a lower base fee than Plan C

**PART II — Short Constructed Response (Questions 25–32)**

**Each question is worth 2 credits. Show all work.**

25. Solve the following system algebraically and verify your solution.

$3x + y = 10$

$2x - y = 5$

26. Write the equation of the line that passes through the point $(-2, 7)$ and has a slope of 3. Express your answer in slope-intercept form.

27. Solve the quadratic equation $2x^2 - 5x - 12 = 0$ by factoring. Show all steps.

28. The table below shows values of a function.

x: 0, 1, 2, 3

y: 2, 2.5, 3, 3.5

Determine whether the function is linear, quadratic, or exponential. Justify your answer using the table, then write a function rule.

29. Factor the following expression completely: $6x^2 + 15x$.

30. A geometric sequence has $a_3 = 20$ and $a_4 = 40$. Find the common ratio, the first term, and write the explicit formula for the nth term.

31. Solve the inequality $-3x + 5 \geq 14$ and graph the solution set on a number line.

32. A line of best fit for study data is given by $\hat{y} = 0.8x + 50$, where x is the number of minutes studied and $\hat{y}$ is the predicted test score. A student who studied 30 minutes scored 70.

Calculate the residual and state whether the actual score was above or below the line of best fit.

**PART III — Medium Constructed Response (Questions 33–34)**

**Each question is worth 4 credits. Show all work.**

33. Consider the quadratic function $f(x) = x^2 + 6x + 8$.

a. Find the vertex of the function using the axis of symmetry formula. Show your work.

b. Identify the zeros of f(x) algebraically.

c. Describe the key features of the graph: direction of opening, vertex, axis of symmetry, x-intercepts, and y-intercept. State the minimum value of the function.

34. A printing company charges a one-time setup fee plus a fixed cost per shirt. An order of 50 shirts costs \$400, and an order of 80 shirts costs \$610.

a. Determine the cost per shirt (the slope). Show your work.

b. Write a linear function $C(s)$ that gives the total cost of an order of $s$ shirts.

c. Identify the setup fee and explain what it represents in this context.

d. Use your function to determine the cost of an order of 120 shirts. Show your calculation.

**PART IV — Extended Constructed Response (Question 35)**

**This question is worth 6 credits. Show all work.**

35. A soccer ball is kicked from the ground. Its height $h$ (in meters) after $t$ seconds is modeled by the function $h(t) = -5t^2 + 20t$.

a. Determine the height of the ball at $t = 0$ and explain what this value represents.

b. Find the time at which the ball reaches its maximum height, and determine that maximum height. Use the axis of symmetry and show your work.

c. Determine the time(s) at which the ball is at a height of 15 meters. Solve algebraically and show all work.

d. Determine the time at which the ball returns to the ground. Solve algebraically.

e. Create a table of values for $h(t)$ at $t = 0, 1, 2, 3,$ and 4 seconds, and describe the symmetry you observe in the table.

# ANSWERS KEY AND EXPLANATIONS

1. C — $h = 2A/b$. Multiplying both sides of $A = (1/2)bh$ by 2 gives $2A = bh$, and dividing by $b$ isolates $h = 2A/b$. Each operation is applied to the whole equation to undo the original. The factor of 1/2 is cleared first, then the base is divided out.
2. B — $f(-2) = 11$. Substituting gives $-3(-2) + 5 = 6 + 5 = 11$. Multiplying two negatives produces the positive 6 before the constant is added. Careful sign handling on the first term gives the correct value.
3. D — slope = 2. Solving $4x - 2y = 8$ for $y$ gives $-2y = -4x + 8$, so $y = 2x - 4$ and the slope is 2. Dividing by $-2$ changes the sign of each term. The coefficient of $x$ in slope-intercept form is the slope.

4. A — $(x + 5)^2$. The trinomial is a perfect square because $25 = 5^2$ and the middle term 10x equals 2(5)x. It factors as $(x + 5)^2$. Expanding confirms $x^2 + 10x + 25$.
5. C — V(t) = 250000(1.03)^t. A 3% annual appreciation means each year's value is 103% of the previous year, so the base is 1 + 0.03 = 1.03. The starting value 250,000 is multiplied repeatedly by this growth factor. A base above 1 models exponential growth.
6. A — x = 6 and x = −4. Factoring $x^2 - 2x - 24$ gives $(x - 6)(x + 4) = 0$, so the solutions are 6 and −4. The factor pair of −24 that sums to −2 is −6 and +4. Setting each factor to zero produces the roots.
7. B — $a_n = 12 - 3(n - 1)$. The first term is 12 and the common difference is −3, since each term decreases by 3. The explicit form $a_1 + d(n - 1)$ gives $12 - 3(n - 1)$. A negative common difference reflects the decreasing sequence.
8. D — $b \le 25.5$. The total weight 40b + 180 must not exceed 1,200, giving $40b + 180 \le 1200$, so $40b \le 1020$ and $b \le 25.5$. The driver's weight is a fixed addition, while box weight scales with b. Solving the inequality keeps the load within the limit.
9. C — the point where the two lines intersect. The solution to a system satisfies both equations simultaneously, which graphically is their point of intersection. That point lies on both lines at once. Its coordinates are the values that make both equations true.
10. A — Exponential, with a common ratio of 3. Each output is multiplied by 3 (4, 12, 36, 108), giving a constant ratio rather than a constant difference. A constant multiplier between consecutive terms defines exponential behavior. The ratio 12/4 = 3 confirms the base.
11. D — $-6x^2 + 10x$. Distributing gives $-2x(3x) + (-2x)(-5) = -6x^2 + 10x$. Multiplying two negatives in the second term yields a positive 10x. Both terms inside the parentheses must be multiplied by the monomial.
12. B — shifted horizontally left 6 units. Adding 6 inside the parentheses, $(x + 6)^2$, shifts the parabola in the negative x-direction. Horizontal shifts move opposite to the sign appearing with x, so +6 moves left. Changes inside the function affect the input, producing horizontal movement.
13. C — y = 4x − 3. The slope is (5 − (−3))/(2 − 0) = 8/2 = 4, and the point (0, −3) gives a y-intercept of −3. The equation is therefore y = 4x − 3. Both given points satisfy this line.
14. A — f = 4. The vertex x-value is −b/(2a) = −6/(−2) = 3, and f(3) = −9 + 18 − 5 = 4. Because a < 0, the parabola opens downward and the vertex gives the maximum. The maximum value is the y-coordinate of the vertex.
15. B — $\sqrt{10}$. Since 10 is not a perfect square, its square root is a non-terminating, non-repeating decimal and therefore irrational. The other values are either terminating decimals or fractions of integers, which are rational. Only non-perfect-square roots are irrational here.
16. D — median = 13. With six ordered values, the median is the average of the third and fourth, (12 + 14)/2 = 13. An even count has no single middle value, so the two central values are averaged. The data are already in order, simplifying the calculation.
17. A — 75%. Among the 40 people under 30, 30 prefer coffee, so 30/40 = 0.75 = 75%. The denominator is restricted to the under-30 subgroup, not the full sample. Conditional percentages use the stated group as the whole.
18. C — The residual is 3, so the point is above the line. The predicted value is 3(4) + 10 = 22, and the residual is 25 − 22 = 3. A positive residual means the observed point lies above the line of best fit. Residuals measure the vertical gap between data and prediction.

19. B — $y = 2x + 6$ and $2y = 4x + 12$. Dividing the second equation by 2 produces $y = 2x + 6$, identical to the first, so the two represent the same line. Coincident lines share every point, giving infinitely many solutions. Equations that are scalar multiples of each other are dependent.
20. D — 4. The average rate of change is $[f(4) - f(0)]/(4 - 0) = (12 - (-4))/4 = 16/4 = 4$. Only the endpoint values of the interval are used. The result equals the slope of the segment joining those points.
21. A — 15%. In $V(t) = 18000(0.85)^t$, the base 0.85 equals $1 - 0.15$, indicating a 15% annual decrease. A base between 0 and 1 signals exponential decay. The percent decrease is the difference between 1 and the base.
22. C — two real solutions. The discriminant is $b^2 - 4ac = 25 - 4(1)(2) = 17$, which is positive. A positive discriminant means the parabola crosses the x-axis at two distinct points. The sign of the discriminant determines the number of real solutions.
23. D — $0 \le t \le 20$, until the tank empties. Time begins at $t = 0$ and the height reaches zero when $80 - 4t = 0$, giving $t = 20$ minutes. Negative time and time after the tank empties have no physical meaning. Restricting the domain to this interval keeps the model realistic.
24. B — Plan C charges more per minute but has a lower base fee than Plan D. Plan C has a per-minute rate of $0.10 versus $0.05 for Plan D, while its base fee of $20 is lower than Plan D's $35. The coefficient of x is the per-minute rate, and the constant is the base fee. Comparing both terms confirms the statement.
25. $x = 3$, $y = 1$. Adding the two equations eliminates y: $(3x + y) + (2x - y) = 10 + 5$, giving $5x = 15$ and $x = 3$; then $3(3) + y = 10$, so $y = 1$. Verification: $3(3) + 1 = 10$ and $2(3) - 1 = 5$, so both equations hold. The solution is (3, 1).
26. $y = 3x + 13$. Using point-slope with (−2, 7) and slope 3: $y - 7 = 3(x + 2)$, which expands to $y = 3x + 6 + 7 = 3x + 13$.
27. $x = -3/2$ and $x = 4$. Factoring $2x^2 - 5x - 12$ gives $(2x + 3)(x - 4) = 0$. Setting each factor to zero, $2x + 3 = 0$ yields $x = -3/2$ and $x - 4 = 0$ yields $x = 4$.
28. Linear. The first differences are a constant 0.5 ($2 \rightarrow 2.5 \rightarrow 3 \rightarrow 3.5$), indicating a constant rate of change. With a y-intercept of 2 and slope 0.5, the function rule is $y = 0.5x + 2$.
29. $3x(2x + 5)$. The greatest common factor of $6x^2$ and $15x$ is $3x$. Factoring it out gives $3x(2x + 5)$, which cannot be factored further.
30. $r = 2$, $a_1 = 5$, $a_n = 5(2)^{(n - 1)}$. The common ratio is $a_4/a_3 = 40/20 = 2$. Since $a_3 = a_1r^2 = 4a_1 = 20$, the first term is $a_1 = 5$, giving the explicit formula $a_n = 5(2)^{(n - 1)}$.
31. $x \le -3$. Subtracting 5 gives $-3x \ge 9$, and dividing by −3 reverses the inequality to $x \le -3$. On a number line, this is shown with a closed circle at −3 and shading extending to the left.
32. Residual = −4, below the line. The predicted score is $\hat{y} = 0.8(30) + 50 = 74$, and the residual is $70 - 74 = -4$. Because the residual is negative, the actual score was below the value predicted by the line of best fit.
33. a. The axis of symmetry is $x = -b/(2a) = -6/2 = -3$, and $f(-3) = 9 - 18 + 8 = -1$, giving vertex (−3, −1). b. Factoring $x^2 + 6x + 8 = (x + 4)(x + 2)$ gives zeros $x = -4$ and $x = -2$. c. The parabola opens upward ($a > 0$); the vertex is (−3, −1); the axis of symmetry is $x = -3$; the x-intercepts are (−4, 0) and (−2, 0); the y-intercept is (0, 8); and the minimum value is −1.
34. a. The cost per shirt is $(610 - 400)/(80 - 50) = 210/30 = 7$ dollars per shirt. b. $C(s) = 7s + 50$. c. Using $400 = 7(50) + b$ gives $b = 50$, so the setup fee is $50, the fixed charge applied

to every order before any shirts are counted. d. $C(120) = 7(120) + 50 = 840 + 50 = 890$, so an order of 120 shirts costs $890.

35. a. $h(0) = 0$; the ball starts on the ground at the moment it is kicked. b. The axis of symmetry is $t = -20/(2 \cdot -5) = 2$ seconds, and $h(2) = -5(4) + 20(2) = 20$ meters, the maximum height. c. Setting $-5t^2 + 20t = 15$ gives $-5t^2 + 20t - 15 = 0$; dividing by $-5$ yields $t^2 - 4t + 3 = 0$, which factors as $(t - 1)(t - 3) = 0$, so the ball is at 15 meters at $t = 1$ second and $t = 3$ seconds. d. Setting $-5t^2 + 20t = 0$ gives $-5t(t - 4) = 0$, so $t = 0$ or $t = 4$; the ball returns to the ground at $t = 4$ seconds. e. $h(0) = 0$, $h(1) = 15$, $h(2) = 20$, $h(3) = 15$, $h(4) = 0$; the values are symmetric about $t = 2$, rising to the maximum and then mirroring back down, which reflects the parabola's axis of symmetry at $t = 2$.