PRACTICE EXAM 30: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. What is the solution to the equation $3(2x - 4) = 4x + 6$?

A. $x = 3$

B. $x = 6$

C. $x = 9$

D. $x = -9$

2. A function passes through the points $(0, -2)$, $(1, 1)$, $(2, 4)$, $(3, 7)$, and $(4, 10)$. Which type of function is represented?

A. Exponential, with a common ratio of 3

B. Linear, with a constant rate of change of 3

C. Quadratic, with constant second differences

D. Linear, with a constant rate of change of −2

3. A line passes through the points $(-2, 5)$ and $(4, -7)$. What is the slope of the line?

A. −2

B. 2

C. −1/2

D. 1/2

4. Which inequality represents all values of x for which $-2x + 7 \leq 15$?

A. $x \leq -4$

B. $x \leq 4$

C. $x \geq -4$

D. $x \geq 4$

5. A car purchased for $24,000 decreases in value by 15% each year. Which function models its value V(t) after t years?

A. $V(t) = 24000(1.15)^t$

B. $V(t) = 24000(0.85)^t$

C. $V(t) = 24000(0.15)^t$

D. $V(t) = 24000 - 0.15t$

6. Which expression is the completely factored form of $x^2 - 7x - 18$?

A. $(x - 9)(x + 2)$

B. $(x + 9)(x - 2)$

C. $(x - 6)(x - 3)$

D. $(x - 18)(x + 1)$

7. Which value of x is a solution to the equation $x^2 - 5x - 14 = 0$?

A. $x = -7$

B. $x = 2$

C. $x = 14$

D. $x = 7$

8. A system of equations consists of Line 1 passing through (0, 5) and (5, 0), and Line 2 passing through (0, −2) and (3, 1). The two lines intersect at exactly one point. Which ordered pair represents the solution to this system?

A. (3, 1)

B. (1, 3)

C. (0, 4)

D. (3, −1)

9. If $f(x) = 2x^2 - 3x + 1$, what is the value of $f(-2)$?

A. 3

B. 11

C. 15

D. −1

10. An arithmetic sequence begins 7, 11, 15, 19, … Which explicit formula correctly represents the nth term of this sequence?

A. $a_n = 4 + 7(n - 1)$

B. $a_n = 7 + 4(n - 1)$

C. $a_n = 7(4)^{(n - 1)}$

D. $a_n = 4n + 7$

11. A scatter plot shows weekly inventory of a product during an 8-week marketing campaign with the following data: Week 1 = 28 units, Week 2 = 25, Week 3 = 23, Week 4 = 19, Week 5 = 17, Week 6 = 14, Week 7 = 10, Week 8 = 7. Which value is closest to the correlation coefficient for this data?

A. $r = 0.96$

B. $r = -0.15$

C. $r = 0.42$

D. $r = -0.96$

12. A line passes through the point (0, 4) and has a slope of $-3/2$. Which equation represents this line written in standard form?

A. $3x + 2y = 8$

B. $3x - 2y = 8$

C. $2x + 3y = 8$

D. $-3x + 2y = 4$

13. Which expression is equivalent to $(4x^2 - 2x + 6) - (x^2 + 5x - 3)$?

A. $3x^2 - 7x + 9$

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

C. $3x^2 - 7x + 3$

D. $5x^2 - 7x + 9$

14. Which of the following best describes the transformation from $f(x) = x^2$ to $g(x) = (x - 4)^2$?

A. The graph of f(x) is shifted vertically up 4 units

B. The graph of f(x) is shifted horizontally left 4 units

C. The graph of f(x) is shifted horizontally right 4 units

D. The graph of f(x) is shifted vertically down 4 units

15. A data set summarizing student commute times has a minimum of 2, Q1 = 6, median = 10, Q3 = 15, and maximum = 22. What is the interquartile range, and what does it represent in this context?

A. IQR = 4; the range of the lower half of the commute times

B. IQR = 9; the spread of the middle 50% of students' commute times

C. IQR = 20; the total spread of all the commute times recorded

D. IQR = 5; the distance from the median to the third quartile

16. The function N(t) = 1500(1.06)^t models the membership of a gym t years after it opened. What was the initial membership, and what is the annual growth rate?

A. Initial membership 1.06; growth rate 1500%

B. Initial membership 1506; growth rate 6%

C. Initial membership 1500; growth rate 1.06%

D. Initial membership 1500; growth rate 6%

17. The function $f(x) = 2x^2 - 8x + 1$ has a minimum value. What is that minimum value?

A. -7

B. -15

C. 1

D. 2

18. A cell phone plan charges a flat fee of $20 per month plus $0.10 for each text message sent. Which inequality represents the number of text messages t a customer can send while keeping the monthly bill at or below $35?

A. $t \leq 55$

B. $t \geq 150$

C. $t \leq 150$

D. $t \leq 350$

19. A 10K race recorded finishing times distributed in 10-minute intervals as follows: [0, 10) had 5 runners, [10, 20) had 11 runners, [20, 30) had 14 runners, [30, 40) had 6 runners, and [40, 50) had 4 runners. In which interval is the median finishing time most likely to fall?

A. [0, 10)

B. [20, 30)

C. [10, 20)

D. [30, 40)

20. Which system of equations has no solution?

A. $y = 2x + 1$ and $y = -2x + 1$

B. $y = x - 3$ and $y = 4x + 6$

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

D. $y = 3x - 1$ and $y = 3x + 5$

21. A student graphs the line $y = (3/4)x - 5$. Which point lies on this line?

A. (4, −2)

B. (8, 2)

C. (0, 3/4)

D. (−4, −2)

22. Which statement correctly classifies the number $\sqrt{16}$?

A. It is irrational because it contains a radical sign

B. It is undefined because 16 has two square roots

C. It is rational because it is equal to the integer 4

D. It is irrational because square roots are never rational numbers

23. Two data sets are shown below. Which measure of center would best represent the typical value of Data Set B, and why?

Data Set A: 22, 24, 23, 25, 24, 23, 22

Data Set B: 21, 23, 22, 24, 88, 22, 21

A. Mean; both data sets have a similar spread of values

B. Mean; Data Set B has a higher center than Data Set A

C. Median; every data set should rely on the median by default

D. Median; the value 88 is an outlier that would distort the mean

24. The function $g(x)$ is an upward-opening parabola with vertex at $(-2, -3)$, passing through $(0, 1)$ and $(-4, 1)$. What is the minimum value of $g(x)$?

A. $g = -2$

B. $g = -3$

C. $g = 0$

D. $g = 1$

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.

$4x + y = 11$

$x - 2y = -4$

26. Write the equation of the line that is perpendicular to $y = -2x + 5$ and passes through the point (4, 3). Express your answer in slope-intercept form.

27. A quadratic function has zeros at $x = -2$ and $x = 6$, and a leading coefficient of 3. Write the function in factored form and expand it to standard form.

28. The height $h(t)$ of a launched object (in feet) at time t (in seconds) is recorded at five data points: at $t = 0$ the height is 4 feet; at $t = 1$ the height is 19 feet; at $t = 2$ the height is 24 feet; at $t = 3$ the height is 19 feet; and at $t = 4$ the height is 4 feet.

Determine whether the function is linear or quadratic. Justify your answer using the data. Then identify the maximum height and when it occurs.

29. Factor the following expression completely: $3x^3 - 27x$.

30. An arithmetic sequence has $a_4 = 14$ and $a_9 = 34$. Find the common difference, the first term, and write the explicit formula for the nth term.

31. Graph the solution set of the system of inequalities on a coordinate plane. State one point in the solution region and verify it satisfies both inequalities.

$y \leq -2x + 6$

$y > x - 3$

32. A biologist measures the height of a plant each week and finds a line of best fit $\hat{y} = 4.5x + 12$, where x represents the number of weeks and $\hat{y}$ is the predicted height in centimeters. In week 5, the measured height of the plant was 38 cm.

Calculate the residual for week 5 and explain what the sign of the residual tells you about the data point relative to the line.

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

Each question is worth 4 credits. Show all work.

33. Consider the following assertion:

"For the function $f(x) = x^2 - 8x + 11$, the minimum value of $f(x)$ is -3."

a. Determine whether this assertion is true or false. Show your work by finding the vertex of the function using the axis of symmetry formula.

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. (You do not need to draw the graph — describe each feature precisely.)

34. A coffee shop tracks the daily high temperature x (in °F) and the number of iced coffees sold y. After collecting data over many days, the line of best fit is determined to be $y = 3.5x - 180$, with a correlation coefficient of $r = 0.88$.

a. Interpret the slope of the line of best fit in context.

b. Predict the number of iced coffees sold on a day when the high temperature is 90°F. Show your calculation.

c. On a day when the high temperature was 80°F, the shop actually sold 95 iced coffees. Calculate the residual and determine whether the actual sales were above or below the predicted value.

d. Based on the value of $r = 0.88$, describe the strength and direction of the linear association. Explain whether this correlation proves that higher temperatures cause higher iced coffee sales.

PART IV — Extended Constructed Response (Question 35)

This question is worth 6 credits. Show all work.

35. Two friends each start a monthly savings plan.

Saver A sets aside \$40 in month 1 and increases the amount she sets aside by \$20 each month (linear growth).

Saver B sets aside \$5 in month 1 and triples the amount he sets aside each month (exponential growth).

a. Write a function $A(m)$ for the amount Saver A sets aside and a function $B(m)$ for the amount Saver B sets aside, where m represents the month number (starting at $m = 1$).

b. Create a table of values for both savers for months 1 through 6. Show all calculations.

c. During which month does the amount Saver B sets aside first exceed the amount Saver A sets aside? Justify your answer using your table or algebraic reasoning.

d. After 6 months, how much greater is the amount Saver B sets aside than the amount Saver A sets aside in that month? Show all work.

e. Saver A argues that her total cumulative savings over the 6 months is greater than Saver B's total cumulative savings over the same period. Determine whether this claim is correct by calculating the total cumulativee savings for each saver over the 6 months. Show all work.

ANSWER KEY WITH EXPLANATIONS – PRACTICE EXAM 30

1. C — $x = 9$. Distributing gives $6x - 12 = 4x + 6$, and collecting like terms yields $2x = 18$, so $x = 9$. Performing the same operation on both sides preserves equality, the foundational skill behind all linear equation solving.
2. B — Linear, rate of change 3. The y-values increase by a constant 3 for each one-unit increase in x, which defines a linear function with slope 3. A constant first difference—rather than a common ratio or constant second difference—is the signature of linear behavior.
3. A — −2. The slope is the change in y over the change in x: $(-7 - 5)/(4 - (-2)) = -12/6 = -2$. Keeping the coordinates in the same order in numerator and denominator prevents the sign error that produces the positive distractor.
4. C — $x \geq -4$. Subtracting 7 from both sides gives $-2x \leq 8$, and dividing by −2 reverses the inequality to $x \geq -4$. Reversing the inequality symbol when dividing by a negative number is the rule that separates the correct answer from its mirror distractor.
5. B — V(t) = 24000(0.85)^t. A 15% annual loss leaves 85% of the value each year, so the decay factor is $1 - 0.15 = 0.85$ applied to the $24,000 start. Exponential decay multiplies by a factor between 0 and 1 each period, unlike the linear subtraction distractor.
6. A — $(x - 9)(x + 2)$. The factors must multiply to −18 and add to −7, which −9 and +2 satisfy. Confirming that the outer and inner products combine to the middle term −7x verifies the factorization.
7. D — $x = 7$. Factoring gives $(x - 7)(x + 2) = 0$, so $x = 7$ or $x = -2$, and 7 is the listed solution. Setting each factor equal to zero applies the zero-product property, the standard method for factorable quadratics.
8. A — (3, 1). The solution to a system of two lines is the point where the lines cross. Line 1 (negative slope through (0, 5)) and Line 2 (positive slope through (0, −2)) meet at the single point (3, 1), which satisfies both equations.
9. C — 15. Substituting $x = -2$ gives $2(-2)^2 - 3(-2) + 1 = 8 + 6 + 1 = 15$. Squaring the negative input before applying the coefficient, and treating $-3(-2)$ as +6, avoids the sign errors behind the distractors.

10. B — $a_n = 7 + 4(n - 1)$. The first term is 7 and the common difference is 4, so the explicit arithmetic formula is $a_1 + d(n - 1)$. Assigning the first term and the difference to their correct roles separates this from the swapped-value distractor.
11. D — $r = -0.96$. The data show inventory decreasing steadily from 28 to 7 as the campaign week increases, indicating a strong negative linear relationship near −1. The negative sign reflects the decreasing trend, and the magnitude near 1 reflects how closely the points hug the line.
12. A — $3x + 2y = 8$. Starting from $y = -(3/2)x + 4$ and multiplying through by 2 gives $2y = -3x + 8$, which rearranges to $3x + 2y = 8$. Standard form requires a positive leading coefficient and no fractions, both achieved here.
13. A — $3x^2 - 7x + 9$. Distributing the subtraction gives $4x^2 - 2x + 6 - x^2 - 5x + 3$, and combining like terms yields $3x^2 - 7x + 9$. Applying the negative sign to every term inside the second parentheses is the step that defeats the sign-error distractors.
14. C — shifted horizontally right 4 units. Subtracting a constant inside the squared term, as in $(x - 4)^2$, moves the graph in the positive x-direction. Horizontal shifts move opposite to the sign attached to x, which is why a minus sign produces a rightward shift.
15. B — IQR = 9. The interquartile range is $Q3 - Q1 = 15 - 6 = 9$, representing the spread of the middle 50% of the data. The IQR measures variability while resisting the pull of extreme values, making it a robust measure of spread.
16. D — Initial membership 1500; growth rate 6%. In the form $a(1 + r)^t$, the coefficient 1500 is the initial value and the base 1.06 means $r = 0.06$, or 6% annual growth. Reading the base as $1 + r$ rather than as the rate itself rules out the 1.06% distractor.
17. A — −7. The vertex occurs at $x = -b/(2a) = 8/4 = 2$, and substituting gives $2(2)^2 - 8(2) + 1 = 8 - 16 + 1 = -7$. For an upward-opening parabola the vertex y-value is the minimum, so −7 is the least output of the function.
18. C — $t \leq 150$. The bill is $20 + 0.10t$, and setting $20 + 0.10t \leq 35$ gives $0.10t \leq 15$, so $t \leq 150$. Modeling the flat fee as a constant and the per-text charge as a variable rate produces the correct inequality before solving.
19. B — [20, 30). With 40 runners total, the median lies between the 20th and 21st values; cumulative counts of 5 and 16 through the first two intervals place both positions inside the third interval. The median falls in the interval where the running total first passes the halfway point.
20. D — $y = 3x - 1$ and $y = 3x + 5$. These lines share slope 3 but have different y-intercepts, so they are parallel and never intersect, giving no solution. Equal slopes with unequal intercepts is the defining condition for an inconsistent system.
21. A — (4, −2). Substituting $x = 4$ gives $(3/4)(4) - 5 = 3 - 5 = -2$, matching the y-coordinate. A point lies on a line only when its coordinates satisfy the equation, which testing each candidate confirms.
22. C — rational because it equals the integer 4. Since $\sqrt{16} = 4$, the value is a whole number and therefore rational, expressible as 4/1. A radical sign alone does not make a number irrational; only a non-perfect-square radicand produces an irrational result.
23. D — Median; the value 88 is an outlier that would distort the mean. The extreme value 88 pulls the mean far above the cluster of values near 22, while the median stays representative of the typical data point. The median is the preferred measure of center whenever a data set contains outliers.

24. B — $g = -3$. The parabola is upward-opening with vertex at $(-2, -3)$, and the y-coordinate of the vertex is the minimum value. For a parabola opening upward, no output falls below the vertex, so the minimum of $g(x)$ is -3.

25. — Solution (2, 3). From $4x + y = 11$, $y = 11 - 4x$; substituting into $x - 2y = -4$ gives $x - 2(11 - 4x) = -4$, so $9x = 18$ and $x = 2$, then $y = 3$. Verification: $4(2) + 3 = 11$ and $2 - 2(3) = -4$, both true.

26. — $y = (1/2)x + 1$. The perpendicular slope is the negative reciprocal of -2, which is $1/2$; using point (4, 3): $3 = (1/2)(4) + b$ gives $b = 1$. Perpendicular lines have slopes whose product is -1, which fixes the new slope before the point sets the intercept.

27. — Factored: $f(x) = 3(x + 2)(x - 6)$; standard: $f(x) = 3x^2 - 12x - 36$. Each zero r contributes a factor $(x - r)$, so zeros -2 and 6 give $(x + 2)(x - 6)$, scaled by the leading coefficient 3. Expanding $(x + 2)(x - 6) = x^2 - 4x - 12$ and multiplying by 3 yields the standard form.

28. — Quadratic; maximum height 24 feet at $t = 2$ seconds. The first differences (15, 5, −5, −15) are not constant, but the second differences are constant at −10, identifying a quadratic. The symmetric values rise to 24 at $t = 2$ and fall thereafter, marking the vertex and the maximum.

29. — $3x(x - 3)(x + 3)$. Factoring out the greatest common factor 3x gives $3x(x^2 - 9)$, and $x^2 - 9$ is a difference of squares that factors into $(x - 3)(x + 3)$. Removing the GCF first is essential so the remaining binomial can be recognized as a difference of squares.

30. — Common difference 4, first term 2, formula $a_n = 2 + 4(n - 1)$. The difference is $(34 - 14)/(9 - 4) = 20/5 = 4$, and $a_1 = a_4 - 3d = 14 - 12 = 2$. Substituting into $a_1 + d(n - 1)$ gives the explicit formula, which simplifies to $4n - 2$.

31. — Sample solution point (0, 0). Testing (0, 0): $0 \leq -2(0) + 6$ is $0 \leq 6$ (true), and $0 > 0 - 3$ is $0 > -3$ (true), so the point lies in the overlapping region. The solution set is the region below the solid line $y = -2x + 6$ and above the dashed line $y = x - 3$.

32. — Residual = +3.5; the point lies above the line. The predicted height is $4.5(5) + 12 = 34.5$ cm, and the residual is observed minus predicted: $38 - 34.5 = 3.5$. A positive residual means the actual value exceeds the prediction, so the measured plant is taller than the model estimates.

33. — a. False. The axis of symmetry is $x = -b/(2a) = 8/2 = 4$, and $f(4) = 16 - 32 + 11 = -5$, so the minimum value is −5, not −3. b. Zeros $x = 4 \pm \sqrt{5}$. The quadratic formula gives $x = [8 \pm \sqrt{(64 - 44)}]/2 = [8 \pm \sqrt{20}]/2 = 4 \pm \sqrt{5}$. c. Opens upward ($a > 0$); vertex (4, −5); axis of symmetry $x = 4$; x-intercepts at $4 - \sqrt{5}$ and $4 + \sqrt{5}$; y-intercept at (0, 11).

34. — a. The slope 3.5 means each 1°F increase in the daily high temperature is associated with about 3.5 additional iced coffees sold. b. Predicted sales at 90°F: $3.5(90) - 180 = 315 - 180 = 135$ iced coffees. c. At 80°F the prediction is $3.5(80) - 180 = 100$; residual = $95 - 100 = -5$, so actual sales were below the predicted value. d. $r = 0.88$ indicates a strong positive linear association.

Correlation does not establish causation; a third factor such as season or weekend traffic could drive both temperature and sales, so the relationship is not proven to be causal.

35. — a. $A(m) = 40 + 20(m - 1)$; $B(m) = 5(3)^{(m - 1)}$. b. Saver A (months 1–6): 40, 60, 80, 100, 120, 140. Saver B (months 1–6): 5, 15, 45, 135, 405, 1215, each value the previous tripled. c. Month 4. Through month 3, A exceeds B (80 > 45); at month 4, B = 135 exceeds A = 100 for the first time. d. Month 6 difference: $B(6) - A(6) = 1215 - 140 = 1075$. Saver B sets aside $1,075 more than Saver A that month. e. The claim is incorrect. Cumulative totals: A = 40 + 60 + 80 + 100 + 120 + 140 = 540; B = 5 + 15 + 45 + 135 + 405 + 1215 = 1820. Saver B's $1,820 exceeds Saver A's $540, so A's claim is false.