# PRACTICE EXAM 33

# NY REGENTS ALGEBRA I SIMULATION — 35 QUESTIONS

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**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: $(2x - 1)/3 = (x + 4)/2$.

A. $x = 7$

B. $x = 2$

C. $x = -14$

D. $x = 14$

2. A linear function has the following table of values: (1, 2), (3, 8), (5, 14), and (7, 20). What is the rate of change of the function?

A. 2

B. 3

C. 6

D. 4

3. A radioactive sample with a mass of 160 grams has a half-life of 4 days. Which function models the mass m remaining after d days?

A. $m(d) = 160(2)^{(d/4)}$

B. $m(d) = 160 - (1/2)d$

C. $m(d) = 160(1/2)^{(d/4)}$

D. $m(d) = 160(1/2)^{(4d)}$

4. Which expression is the completely factored form of $x^3 + 2x^2 + 3x + 6$?

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

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

C. $(x + 2)(x^2 - 3)$

D. $(x - 2)(x^2 + 3)$

5. What is the solution to the system $2x + 3y = 13$ and $4x - y = 5$?

A. (3, 2)

B. (1, 5)

C. (4, 11)

D. (2, 3)

6. Which equation expresses $y = x^2 + 8x + 10$ in vertex form?

A. $y = (x + 4)^2 + 10$

B. $y = (x - 4)^2 - 6$

C. $y = (x + 4)^2 - 6$

D. $y = (x + 8)^2 - 6$

7. Function P increases by 6 for every increase of 2 in x. Function Q is defined by $y = 4x - 1$. Which statement correctly compares their rates of change?

A. P, because its rate of change is greater

B. Q, because its rate of change is greater

C. Both functions have the same rate of change

D. Neither function has a constant rate of change

8. A gym charges a $25 joining fee plus $15 per month. Which inequality represents the number of months m for which the total cost stays at or below $145?

A. $15m + 25 \leq 145$

B. $25m + 15 \leq 145$

C. $15m + 25 \geq 145$

D. $15m - 25 \leq 145$

9. What are the solutions to the equation $2x^2 - 4x - 3 = 0$?

A. $x = (2 \pm \sqrt{10})/4$

B. $x = (-2 \pm \sqrt{10})/2$

C. $x = (2 \pm \sqrt{10})/2$

D. $x = (4 \pm \sqrt{10})/2$

10. An investment of $2,000 earns 5% interest compounded annually. What is its value after 3 years?

A. $2,300.00

B. $2,100.00

C. $2,305.00

D. $2,315.25

11. An exponential function passes through the points (0, 1), (1, 2), (2, 4), and (3, 8), and approaches the x-axis as a horizontal asymptote on the left side. What is the range of the function?

A. all real numbers

B. $y > 0$

C. $y \geq 0$

D. $y < 0$

12. A car's fuel tank holds 12 gallons, and the function $d(g) = 28g$ gives the number of miles driven on g gallons of fuel. What is a reasonable domain for this function?

A. $0 \leq g \leq 12$

B. $0 \leq g \leq 28$

C. all real numbers

D. $0 \leq g \leq 336$

13. Which expression is equivalent to $(x - 5)(x + 5)$?

A. $x^2 + 25$

B. $x^2 - 10x + 25$

C. $x^2 + 10x - 25$

D. $x^2 - 25$

14. In the arithmetic sequence 3, 7, 11, 15, …, which term has a value of 43?

A. The 9th term

B. The 10th term

C. The 11th term

D. The 12th term

15. A line of best fit is given by $\hat{y} = 0.8x + 5$. For an x-value of 10, the observed data value is 11. What is the residual?

A. −2

B. 13

C. 2

D. 11

16. In a data set, the largest value is replaced with a value that is far larger than before. Which statement best describes the effect on the measures of center?

A. The median changes the most

B. The mean changes the most

C. The mode changes the most

D. No measure of center changes

17. An upward-opening parabola has its vertex at (0, 2) and stays entirely above the x-axis. How many real x-intercepts does the function have?

A. One

B. Two

C. Three

D. None

18. What are the solutions to the equation $|2x + 1| = 9$?

A. $x = 4$ and $x = -5$

B. $x = 4$ only

C. $x = 5$ and $x = -4$

D. $x = -4$ and $x = 5$

19. A company's cost is modeled by $C = 8x + 600$ and its revenue by $R = 20x$, where x is the number of units. At how many units does the company break even?

A. 30

B. 75

C. 50

D. 100

20. A function f(x) has the following table of values: (0, −4), (1, −2), (2, 0), (3, 2), and (4, 4). For which value of x is f(x) = 0?

A. $x = 0$

B. $x = 2$

C. $x = -4$

D. $x = 4$

21. A pool is draining according to $V(t) = 4000 - 250t$, where V is the volume in gallons and t is the time in minutes. How much water drains each minute?

A. 4,000 gallons

B. 250 minutes

C. 16 gallons

D. 250 gallons

22. A rocket is launched and its height in feet is modeled by $h(t) = -16t^2 + 80t$, where t is in seconds. At what time does the rocket return to the ground?

A. 5 seconds

B. 80 seconds

C. 16 seconds

D. 2.5 seconds

23. A car's value is modeled by $V(t) = 18000(0.88)^t$, where t is in years. What is the annual rate of depreciation?

A. 88%

B. 18%

C. 12%

D. 0.88%

24. A linear inequality is represented by a solid line passing through (0, −1) and (2, 3), with the region above and to the left of the line shaded. Which inequality is represented?

A. $y > 2x - 1$

B. $y \geq 2x - 1$

C. $y \leq 2x - 1$

D. $y < 2x - 1$

25. Which expression is the completely factored form of $5x^2 - 20x - 105$?

A. $5(x - 7)(x + 3)$

B. $(5x - 21)(x + 5)$

C. $5(x + 7)(x - 3)$

D. $(x - 7)(5x + 15)$

26. A student scored 80, 85, and 90 on three tests. What score on a fourth test would give the student a mean of 86?

A. 86

B. 90

C. 88

D. 89

27. The perimeter of a rectangle is given by $P = 2l + 2w$. Which equation correctly solves this formula for w?

A. $w = (P - 2l)/2$

B. $w = P - 2l$

C. $w = (P - l)/2$

D. $w = 2P - l$

28. A parabola has a vertex at $(-3, 4)$ and opens upward. Which equation could represent this parabola?

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

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

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

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

29. The larger of two numbers is 4 more than twice the smaller number. The sum of the two numbers is 28. What is the smaller number?

A. 8

B. 20

C. 12

D. 10

30. A function has the following table of values: (0, 2), (1, 6), (2, 18), and (3, 54). Which statement best describes the function?

A. Linear, with a rate of change of 4

B. Linear, with a rate of change of 2

C. Exponential, with a common ratio of 2

D. Exponential, with a common ratio of 3

31. A study found a line of best fit $\hat{y} = 6x + 50$ relating the number of study hours x to a test score y. What does the slope of 6 represent in this context?

A. A student who studies 0 hours scores 6

B. The maximum possible score is 6

C. Each additional hour of study is associated with about 6 more points

D. Test scores decrease by 6 points per hour

32. Which inequality represents the solution to $-2 < x + 3 \leq 5$?

A. $-5 \leq x < 2$

B. $-5 < x \leq 2$

C. $-2 < x \leq 5$

D. $-5 < x < 2$

33. If $f(x) = (1/2)^x$, what is the value of $f(-2)$?

A. 4

B. 1/4

C. −4

D. 1/2

34. A downward-opening parabola has its vertex at (1, 5) and passes through the points (−1, 1) and (3, 1). What is the maximum value of the function?

A. 1

B. −5

C. 0

D. 5

35. Two data sets are summarized by box plots. Set A has minimum 8, Q1 = 15, median = 20, Q3 = 28, and maximum 36. Set B has minimum 4, Q1 = 10, median = 14, Q3 = 20, and maximum 30. Which statement correctly compares the medians of the two data sets?

A. Set B has the greater median, because its box is wider

B. The two data sets have equal medians

C. Set A has the greater median, because its median value is higher

D. The medians cannot be determined from box plots

## ANSWER KEY WITH EXPLANATIONS – PRACTICE EXAM 33

1. D — $x = 14$. Cross-multiplying gives $2(2x - 1) = 3(x + 4)$, so $4x - 2 = 3x + 12$, and isolating x yields $x = 14$. Cross-multiplication clears both denominators in a single step.
2. B — 3. The y-values rise by 6 each time x rises by 2, so the rate of change is $6/2 = 3$. A constant ratio between change in output and change in input defines the slope of a linear function.
3. C — $m(d) = 160(1/2)^{(d/4)}$. A half-life of 4 days means the sample is multiplied by 1/2 every 4 days, so the exponent is d divided by the half-life. Dividing time by the half-life counts how many halving periods have elapsed.
4. A — $(x + 2)(x^2 + 3)$. Factoring by grouping gives $x^2(x + 2) + 3(x + 2)$, and the common binomial factor $(x + 2)$ yields $(x + 2)(x^2 + 3)$. Grouping pairs of terms with shared factors is the standard approach for four-term polynomials.
5. D — (2, 3). From $4x - y = 5$ the value $y = 4x - 5$; substituting into $2x + 3(4x - 5) = 13$ gives $14x = 28$, so $x = 2$ and $y = 3$. Substitution works cleanly when one equation simplifies to express one variable in terms of the other.
6. C — $(x + 4)^2 - 6$. Completing the square on $x^2 + 8x$ gives $(x + 4)^2 - 16$, and adding the original constant 10 produces $(x + 4)^2 - 6$. The vertex form reveals the vertex at $(-4, -6)$ directly from the equation.
7. B — Q, because its rate of change is greater. Function P has a rate of $6/2 = 3$, while function Q has a slope of 4, so Q changes faster per unit of x. Comparing rates of change requires expressing both as a per-unit slope.

8. A — $15m + 25 \leq 145$. The total cost is the $25 joining fee plus $15 per month, and this must stay at or below $145. Modeling the fixed fee as a constant and the recurring charge as a variable rate produces the correct inequality.
9. C — $x = (2 \pm \sqrt{10})/2$. Applying the quadratic formula gives $x = [4 \pm \sqrt{(16 + 24)}]/4 = [4 \pm 2\sqrt{10}]/4$, which simplifies to $(2 \pm \sqrt{10})/2$. Reducing the radical and dividing every numerator term by the common factor yields the simplest exact form.
10. D — $2,315.25. Compound interest gives $A = 2000(1.05)^3 = 2000(1.157625) = 2,315.25$. Compounding multiplies the principal by $1 + r$ once per compounding period, producing growth that accelerates each year.
11. B — $y > 0$. The graph approaches $y = 0$ as a horizontal asymptote but never touches it, and outputs grow without bound. The range of a basic exponential function never includes zero, ruling out the inclusive distractor.
12. A — $0 \leq g \leq 12$. The tank physically holds between 0 and 12 gallons, so the input g is restricted to that interval. Real-world contexts limit the domain to values the situation actually permits.
13. D — $x^2 - 25$. The product of a sum and difference $(x - 5)(x + 5)$ is the difference of squares $x^2 - 5^2$. The middle terms cancel because the outer and inner products are exact opposites.
14. C — The 11th term. Solving $3 + 4(n - 1) = 43$ gives $4(n - 1) = 40$, so $n - 1 = 10$ and $n = 11$. The arithmetic formula $a_1 + d(n - 1)$ lets any target value be located by solving for n.
15. A — −2. The predicted value is $0.8(10) + 5 = 13$, and the residual is observed minus predicted: $11 - 13 = -2$. A negative residual indicates the actual data point lies below the line of best fit.
16. B — The mean changes the most. The mean uses every value, so a larger extreme increases the sum and pulls the average up, while the median and mode depend only on position or frequency. Mean is the measure most sensitive to extreme values, which is why it can be misleading for skewed data.
17. D — None. The parabola opens upward with its vertex at (0, 2) lying above the x-axis, so the curve never crosses the x-axis. A parabola with a minimum above zero has no real roots.
18. A — $x = 4$ and $x = -5$. The absolute-value equation splits into $2x + 1 = 9$, giving $x = 4$, and $2x + 1 = -9$, giving $x = -5$. Two solutions arise because both a quantity and its opposite share the same distance from zero.
19. C — 50. Setting cost equal to revenue gives $8x + 600 = 20x$, so $12x = 600$ and $x = 50$. The break-even point is the production level at which revenue first covers total cost.
20. B — $x = 2$. The table lists $f(2) = 0$ directly, so the input that produces an output of zero is $x = 2$. Zeros of a function are the x-values where the output equals zero, regardless of how the function is represented.
21. D — 250 gallons. The slope of $V(t) = 4000 - 250t$ is −250, meaning the volume decreases by 250 gallons each minute. The coefficient of t represents the per-minute rate of drainage.
22. A — 5 seconds. Setting $h(t) = 0$ gives $-16t^2 + 80t = 0$, factored as $t(-16t + 80) = 0$, so $t = 0$ or $t = 5$. The non-zero root represents the moment the rocket returns to the ground after its initial launch.
23. C — 12%. In $V(t) = 18000(0.88)^t$, the decay factor 0.88 equals $1 - r$, giving $r = 0.12$ or 12% per year. Reading the base of an exponential decay model as $1 - r$ recovers the percent loss rate.

24. B — $y \geq 2x - 1$. The solid line indicates the boundary is included, and shading above the line corresponds to y-values greater than the line. A solid line signals "or equal to," while shading above signals "greater than."
25. A — $5(x - 7)(x + 3)$. Factoring out the GCF 5 leaves $x^2 - 4x - 21$, which factors into $(x - 7)(x + 3)$ since −7 and 3 multiply to −21 and add to −4. Removing the GCF first ensures the answer is in completely factored form.
26. D — 89. A mean of 86 across four tests requires a total of 344, and the first three scores sum to 255, so the fourth must be 344 − 255 = 89. The mean determines the total, which then locates any missing value by subtraction.
27. A — $w = (P - 2l)/2$. Subtracting 2l from both sides of $P = 2l + 2w$ gives $P - 2l = 2w$, and dividing by 2 yields $w = (P - 2l)/2$. Reversing the operations applied to the target variable is the standard literal-equation technique.
28. B — $y = (x + 3)^2 + 4$. Vertex form $a(x - h)^2 + k$ uses $h = -3$ and $k = 4$, producing $(x + 3)^2 + 4$, and the positive coefficient confirms it opens upward. The sign attached to h flips inside the parentheses, so a vertex at −3 appears as $(x + 3)$.
29. A — 8. Letting the smaller number be s, the larger is $2s + 4$, and $s + (2s + 4) = 28$ gives $3s = 24$, so $s = 8$. Defining the unknown clearly and writing one equation in one variable solves a two-number word problem efficiently.
30. D — Exponential, with a common ratio of 3. Each y-value is three times the previous one (6, 18, 54), indicating a constant multiplier rather than a constant difference. A constant ratio between successive outputs identifies an exponential function.
31. C — Each additional hour of study is associated with about 6 more points. The slope of a regression line measures the predicted change in y per unit increase in x. The intercept gives the value at $x = 0$, so the slope answers the per-unit interpretation question.
32. B — $-5 < x \leq 2$. Subtracting 3 from each part of $-2 < x + 3 \leq 5$ gives $-5 < x \leq 2$. Operations on a compound inequality must be applied to all three parts at once to preserve the relationships.
33. A — 4. A negative exponent inverts the base, so $(1/2)^{-2} = 2^2 = 4$. Negative exponents convert the expression to the reciprocal raised to the positive power.
34. D — 5. The parabola opens downward with its vertex at (1, 5), and the y-coordinate of the vertex is the maximum value for a downward-opening parabola. The vertex marks the highest point on the graph.
35. C — Set A has the greater median, because its median value is higher. The median of Set A is 20, and the median of Set B is 14, so Set A's center is greater. Comparing the median values of two box plots directly answers which data set has a higher center.