PRACTICE EXAM 25

NY REGENTS ALGEBRA I SIMULATION — 35 QUESTIONS

Recommended Time: 3 Hours

Required Tools: Graphing Calculator, Straightedge

Directions: Answer all 35 questions. For Part I, select the best answer. For Parts II, III, and IV, show all work. 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. Which of the following correctly simplifies $(-3x^2y)^3$?

A. $-9x^6y^3$

B. $-27x^6y^3$

C. $27x^6y^3$

D. $-27x^5y^3$

2. A linear function f passes through (−2, 5) and (4, −7). Which equation represents f(x)?

A. $y = 2x + 9$

B. $y = -2x + 1$

C. $y = 2x - 3$

D. $y = -2x + 1$

Wait — B and D are identical. Rebuild Q2. Key is D.

2. A linear function f passes through (−2, 5) and (4, −7). Which equation represents f(x)?

A. $y = 2x - 3$

B. $y = -2x + 9$

C. $y = 2x + 9$

D. $y = -2x + 1$

3. Which of the following correctly factors $4x^2 + 12x + 9$?

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

B. $(4x + 3)(x + 3)$

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

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

4. The table below shows values of two functions.

xf(x)g(x)00413621283271044812

Which of the following best describes how f(x) and g(x) compare for large values of x?

A. g(x) always exceeds f(x) because it starts with a larger value at x = 0

B. f(x) and g(x) remain equal for all positive x

C. f(x) will eventually and permanently exceed g(x) because f grows at an accelerating rate

D. g(x) grows faster because it has a constant positive rate of change

5. What is the solution to $(x + 7)/2 = 5$?

A. $x = 1$

B. $x = 1.5$

C. $x = 2$

D. $x = 3$

6. Which of the following correctly identifies the zeros of $f(x) = x^3 + x^2 - 12x$?

A. $x = 3$ and $x = -4$

B. $x = 0$, $x = 3$, and $x = -4$

C. $x = 0$, $x = -3$, and $x = 4$

D. $x = 12$ and $x = -12$

7. Which of the following correctly applies the quadratic formula to $2x^2 + 5x - 3 = 0$?

A. $x = [-5 \pm \sqrt{(25 + 24)}] / 2 = [-5 \pm 7] / 2 \rightarrow x = 1$ and $x = -6$

B. $x = [-5 \pm \sqrt{(25 - 24)}] / 4 \rightarrow x = 1/2$ only

C. $x = [-5 \pm \sqrt{(25 + 24)}] / 4 \rightarrow x = 1/2$ and $x = -3$

D. $x = [5 \pm \sqrt{49}] / 4 \rightarrow x = 3$ and $x = -1/2$

8. A student incorrectly evaluates $(-2)^4$ and writes -16. What is the correct value, and what error did the student make?

A. The correct value is 16; the student applied the exponent before the negative sign

B. The correct value is −16; the student is correct

C. The correct value is 16; the student confused $(-2)^4$ with $-(2^4)$, treating the negative as separate from the base

D. The correct value is 8; the student multiplied instead of raised to the fourth power

9. The explicit formula $a_n = -5(3)^{(n-1)}$ describes a geometric sequence. What are the first three terms and the common ratio?

A. −5, −15, −45; r = 3

B. −5, −15, −45; r = −3

C. 5, 15, 45; r = 3

D. −5, 15, −45; r = −3

10. Which of the following is the equation of the line passing through (3, −2) that is perpendicular to the line 2x − 5y = 10?

A. y = (2/5)x − 4

B. y = (5/2)x − 2

C. y = −(2/5)x + 4

D. $y = -(5/2)x + (11/2)$

11. A data set has values 8, 15, 20, 25, 32, 38, 45, 90. Which of the following correctly identifies whether 90 is an outlier?

A. 90 is not an outlier because it is only slightly above the maximum

B. 90 is an outlier; Q1=17.5, Q3=41.5, IQR=24, upper fence=77.5, and 90 > 77.5

C. 90 is not an outlier because all values belong to the data set by definition

D. 90 is an outlier; IQR=30, upper fence=45+45=90, so 90 is exactly on the fence

12. A business models daily profit with $P(x) = -x^2 + 14x - 40$, where x is units sold. At what two production levels does the business break even?

A. $x = 2$ and $x = 12$

B. $x = 7$ and $x = 7$ (one repeated solution)

C. $x = 4$ and $x = 10$

D. $x = 5$ and $x = 9$

13. Which of the following correctly describes all transformations from $y = x^2$ to $y = 3(x - 1)^2 + 4$?

A. Shift left 1, vertical stretch by 3, shift down 4

B. Shift right 1, vertical compression by 3, shift up 4

C. Shift right 1, vertical stretch by 3, reflect over x-axis, shift up 4

D. Shift right 1, vertical stretch by 3, shift up 4

14. A system of equations has no solution. Which pair of equations represents this system?

A. $y = 4x - 3$ and $y = 4x + 7$

B. $y = 4x - 3$ and $y = -4x + 7$

C. $y = 4x - 3$ and $8x - 2y = 6$

D. $y = 4x - 3$ and $y = (1/4)x + 7$

15. Two students solve $|3x - 6| = 12$. Student A gets $x = 6$ and $x = -2$. Student B gets $x = 6$ only. Who is correct?

A. Student B — absolute value equations always have one positive solution

B. Student A — but $x = -2$ is extraneous since you cannot input negative x

C. Student B — the negative case gives $x = -2$, which must be rejected

D. Student A — both solutions are valid: $|3(6)-6|=12$ ✓ and $|3(-2)-6|=|-12|=12$ ✓

16. Which of the following correctly classifies the number $\sqrt{(49/4)}$?

A. Irrational, because square roots are always irrational

B. Irrational, because 49 and 4 are both perfect squares but their ratio is not

C. Rational, because $\sqrt{(49/4)} = 7/2$, which is a ratio of two integers

D. Rational, because all fractions are rational numbers

17. A student writes the standard form of $f(x) = 5(x - 2)^2 - 7$ as $5x^2 - 20x + 13$. Is this correct?

A. Yes — $5(x^2-4x+4)-7=5x^2-20x+20-7=5x^2-20x+13$ ✓

B. No — the correct standard form is $5x^2 - 4x + 13$

C. No — the correct standard form is $5x^2 - 20x + 27$

D. No — the correct standard form is $5x^2 - 20x - 3$

18. The box plot below summarizes the scores on a chapter test for two classes.

ClassMinQ1MedQ3MaxClass P4265748398Class Q55707888100

Which statement is supported by the data?

A. Class P performed better overall because it has a larger range

B. Class Q's median is higher, but Class P has greater variability (larger IQR)

C. Both classes have the same IQR and the same range

D. Class Q performed better on every measure of center and spread

19. Which of the following correctly represents the solution to $-4 \leq 3x + 5 < 14$?

A. $-4 \leq x < 14$

B. $-3 \leq x < 3$

C. $-3 < x \leq 3$

D. $-4 < x < 3$

20. A function is defined by the table below.

xf(x)0−3112539413

A student uses these values and writes the regression equation as $\hat{y} = 4x - 3$, with $r = 1$. Is this student correct?

A. No — r cannot equal 1 for any real data set

B. No — the slope should be 3 since consecutive outputs increase by 3

C. Yes — the data is perfectly linear with slope 4 and y-intercept −3, giving r = 1 ✓

D. No — the equation is correct but r should be −1 since the slope is negative

21. A student expands $(x + 4)(x^2 - 4x + 16)$ and writes $x^3 + 64$. Is this correct?

A. No — the correct expansion is $x^3 + 4x^2 - 16x + 64$

B. No — the correct expansion is $x^3 - 64$

C. No — the correct expansion is $x^3 + 16x^2 - 64$

D. Yes — $(x + 4)(x^2 - 4x + 16) = x^3 + 64$, the sum of cubes formula ✓

22. Which of the following correctly identifies the range of $f(x) = 2|x + 3| - 5$?

A. $f(x) \geq -5$

B. $f(x) \leq -5$

C. $f(x) \geq 3$

D. All real numbers

23. A company's sales S(t) = 500(1.08)^t grow exponentially. Which of the following correctly calculates S(5) and interprets it?

A. S(5) = 2,500; sales grow by $500 each year

B. $S(5) \approx 734$; approximately 734 units are sold after 5 years

C. $S(5) \approx 500(1.4693) \approx 734.65$; the approximation is wrong

D. $S(5) = 500(1.08)^5 \approx 734.66$; approximately 735 units sold after 5 years

Wait — B and D both give ≈734–735. Key is B. Rebuild D to be clearly wrong.

23. A company's sales $S(t) = 500(1.08)^t$ grow exponentially. Which of the following correctly calculates and interprets $S(5)$?

A. $S(5) = 500 + 5(1.08) = 505.4$; the model is linear, not exponential

B. $S(5) = 500(1.08)^5 \approx 734.66 \approx 735$ units sold after 5 years

C. $S(5) = 500(5.40) = 2700$; the growth factor is multiplied by the number of years

D. $S(5) = 500(1.08) \cdot 5 = 270$; the base is applied once then multiplied by t

24. Which of the following correctly factors $9x^2 - 6x + 1$?

A. $(9x - 1)(x - 1)$

B. $(3x + 1)^2$

C. $(3x - 1)^2$

D. $(3x - 1)(3x + 1)$

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

Each question is worth 2 credits. Show all work.

25. Solve the system below using substitution. Classify the system and verify your solution.

$3x + 2y = 16$

$y = x + 2$

26. The height (in feet) of a projectile is modeled by $h(t) = -16t^2 + 96t$.

a. Find the maximum height and when it occurs.

b. Find when the projectile lands. Show algebraic work.

c. Find h(2) and h(4) and explain the symmetry.

27. A data set contains: 5, 11, 14, 18, 22, 27, 33, 40, 48, 120.

a. Find the mean and median.

b. Determine whether 120 is an outlier using the $1.5 \times IQR$ rule.

c. State which measure of center better represents the data and justify.

28. Determine all values of x satisfying both:

$2x - 1 > 7$ AND $-3x + 4 \geq -8$

Show all steps and graph the solution on a number line. Express in inequality and interval notation.

29. The two functions below are given.

$f(x) = x^2 - 7x + 10$

$g(x) = -2x + 4$

Find all x-values where $f(x) = g(x)$. Show all algebraic work and verify each solution.

30. A recursive sequence is defined as $a_1 = 7$ and $a_n = 2a_{n-1} - 3$.

a. Find the first six terms.

b. Identify the pattern and write it in your own words.

c. This sequence is neither purely arithmetic nor geometric. Explain why.

31. Two investment accounts start with $5,000 each.

Account J earns 4% annual simple interest.

Account K earns 2.5% compound annual interest.

a. Write the function for each account after t years.

b. Compare their values after 10 years (round to nearest dollar).

c. In approximately how many years does Account K first exceed Account J?

32. A student claims: "The expression (x+3)/(3) simplifies to x because the 3s cancel." Identify the error and show the correct simplification, if possible, for $x = 6$ and $x = -3$.

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

Each question is worth 4 credits. Show all work.

33. A rectangular field is to be enclosed using 300 feet of fencing. One side borders a river and requires no fencing.

a. Let w = the width (the two sides perpendicular to the river). Write an expression for the length in terms of w.

b. Write the area function A(w).

c. Find the width that maximizes area using the vertex formula.

d. State the dimensions of the field with maximum area and calculate that maximum area.

34. A researcher records weekly physical activity hours (x) and cholesterol level (y) for 10 patients.

Hours12345678910Cholesterol235225215208200192185178170162

a. Enter the data into the graphing calculator. Find the line of best fit and the correlation coefficient. Round to two decimal places.

b. Interpret the slope and y-intercept in context.

c. Predict the cholesterol level for a patient exercising 12 hours per week.

d. Calculate the residual for the patient at $x = 5$ hours, $y = 200$. Interpret its meaning.

PART IV — Extended Constructed Response (Question 35)

This question is worth 6 credits. Show all work.

35. An environmental agency is modeling the concentration of a chemical pollutant (in parts per billion, ppb) in a river over t years since a cleanup began. Three competing models are proposed:

Model L (Linear): $L(t) = -4.5t + 90$

Model Q (Quadratic): $Q(t) = 0.3t^2 - 8t + 90$

Model E (Exponential): $E(t) = 90(0.88)^t$

a. At $t = 0$, verify that all three models agree on the initial concentration. State that value.

b. Create a table of values for $t = 0, 3, 6, 10, 15$, and 20. Round to one decimal place.

c. According to Model L, in what year does the concentration reach zero? Show algebraic work.

d. Model Q has a vertex (minimum concentration point). Find the vertex and explain what it means in context. Then determine when Q(t) begins to increase again and comment on whether this is physically realistic.

e. At $t = 20$, compare all three models. Which predicts the lowest concentration? Which predicts the highest? Use your table to rank them, and explain why exponential decay tends to produce more realistic long-term pollution models than linear or quadratic models.

Practice Exam 25 – Answer Key and Explanations

1. B — $(-3x^2y)^3$ applies the power to every factor: $(-3)^3=-27$, $(x^2)^3=x^6$, $y^3=y^3$. Result: $-27x^6y^3$. Choice A uses −9 as the coefficient, incorrectly squaring −3 instead of cubing it. Choice C omits the negative sign that results from $(-3)^3=-27$.

2. D — Slope=(−7−5)/(4−(−2))=−12/6=−2. Using point-slope with (−2,5): y−5=−2(x+2)→y=−2x−4+5=−2x+1. Verify: f(4)=−8+1=−7 ✓. Choice B uses +9 as the y-intercept, correctly finding slope −2 but computing b=9 from −7=−2(4)+b → b=1, not 9.

3. A — $4x^2+12x+9$ fits the perfect square trinomial pattern $(a+b)^2=a^2+2ab+b^2$ with a=2x and b=3: $(2x)^2+2(2x)(3)+3^2=(2x+3)^2$. Verify: $(2x+3)^2=4x^2+12x+9$ ✓. Choice C gives $(2x+3)(2x-3)=4x^2-9$, the difference of squares — wrong pattern.

4. C — The table shows f(x) is quadratic (second differences constant) while g(x) is linear (first differences constant at +2). At x=4: f(4)=48>g(4)=12, and the gap widens. The quadratic f grows at an accelerating rate while g adds only 2 per step, so f will eventually and permanently exceed g. Choice A is disproven at x=4 where f(4)=48 far exceeds g(4)=12.

5. D — (x+7)/2=5 → x+7=10 → x=3. The only operation is multiplying both sides by 2 then subtracting 7. Verify: (3+7)/2=10/2=5 ✓. The three incorrect options represent common arithmetic errors at each step.

6. B — Factor: $f(x)=x^3+x^2-12x=x(x^2+x-12)=x(x+4)(x-3)$. Setting each factor to zero: x=0, x=−4, x=3. All three zeros are correct. Choice A lists only x=3 and x=−4, omitting the zero at x=0 from the monomial factor x.

7. C — Apply the quadratic formula with a=2, b=5, c=−3: discriminant=25+24=49. x=(−5±7)/4. Solutions: x=(−5+7)/4=2/4=1/2 and x=(−5−7)/4=−12/4=−3. Verify: 2(1/4)+5(1/2)−3=1/2+5/2−3=3−3=0 ✓. Choice A uses denominator 2 instead of 2a=4.

8. C — $(-2)^4$ means (−2)·(−2)·(−2)·(−2)=16. The base is −2 (including the negative sign), and an even exponent always produces a positive result. The student confused $(-2)^4$ with $-(2^4)=-16$, treating the negative as if it were outside the exponent rather than part of the base.

9. A — Substitute n=1: a_1=−5(3)^0=−5(1)=−5. Substitute n=2: a_2=−5(3)^1=−15. Substitute n=3: a_3=−5(3)^2=−45. Common ratio: −15/−5=3 (positive, since we multiply by 3 each time). Choice D uses r=−3, which would produce alternating signs.

10. D — Rewrite 2x−5y=10 as y=(2/5)x−2; slope=2/5. Perpendicular slope=−5/2. Using point-slope with (3,−2): y+2=−(5/2)(x−3) → y=−(5/2)x+15/2−2=−(5/2)x+11/2. Verify: f(3)=−15/2+11/2=−4/2=−2 ✓. Choice A has slope 2/5 (parallel, not perpendicular).

11. B — Ordered data: 8,15,20,25,32,38,45,90. Q1=(15+20)/2=17.5; Q3=(38+45)/2=41.5; IQR=24. Upper fence=41.5+1.5(24)=41.5+36=77.5. Since 90>77.5, the value 90 is an outlier. Choice D uses IQR=30 with an incorrect fence calculation.

12. C — Set $P(x)=0$: $-x^2+14x-40=0 \rightarrow x^2-14x+40=0 \rightarrow (x-4)(x-10)=0 \rightarrow x=4$ and $x=10$. Verify: $-16+56-40=0$ ✓ and $-100+140-40=0$ ✓. Break-even occurs at 4 and 10 units.

13. D — In $g(x)=3(x-1)^2+4$: $(x-1)$ shifts right 1 unit; multiplying by 3 stretches vertically by a factor of 3 (narrower); adding 4 shifts up 4 units. All three transformations are present with correct directions. Choice B incorrectly states a compression — multiplying by 3 (>1) is a stretch, not a compression.

14. A — Both lines have the form $y=4x+b$ with $b=-3$ and $b=7$ respectively — same slope (4), different y-intercepts, confirming they are parallel and never intersect. Parallel lines with different y-intercepts constitute an inconsistent system with no solution. Choice C ($8x-2y=6 \rightarrow y=4x-3$) is identical to equation 1, making that system dependent, not the pairing here.

15. D — Solve $|3x-6|=12$: Case 1: $3x-6=12 \rightarrow x=6$. Case 2: $3x-6=-12 \rightarrow 3x=-6 \rightarrow x=-2$. Verify both: $|18-6|=12$ ✓ and $|-6-6|=|-12|=12$ ✓. Student A is correct — both solutions are valid, and $x=-2$ is not extraneous since there is no restriction on x in this equation.

16. C — $\sqrt{(49/4)}=\sqrt{49}/\sqrt{4}=7/2$. Since 7 and 2 are both integers, 7/2 is a ratio of integers — the definition of rational. Choice A is wrong because perfect square radicals are rational, not irrational. Choice D is too broad — fractions are rational but this question asks specifically about $\sqrt{(49/4)}$.

17. A — Expand $5(x-2)^2-7$: $5(x^2-4x+4)-7=5x^2-20x+20-7=5x^2-20x+13$. The coefficient 5 distributes to all three terms of the expansion, and $20-7=13$. Verify: at $x=2$: $5(0)-7=-7$ and $5(4)-40+13=20-40+13=-7$ ✓. Choice C uses +27 as the constant, forgetting to subtract 7.

18. D — Class P: IQR=88−65=23. Class Q: IQR=90−70=20. Class Q has a higher median (78 vs. 74) but a smaller IQR (20 vs. 23). Class P has greater variability. Choice B is correct for the first part (Q has higher median) and correctly identifies the larger IQR belongs to P.

19. B — Subtract 5 from all parts: $-4-5\leq 3x<14-5 \rightarrow -9\leq 3x<9$. Divide by 3: $-3\leq x<3$. Left endpoint is closed (included) and right endpoint is open (excluded). Choice A leaves the original bounds without subtracting 5 from each part.

20. C — First differences: 4,4,4,4 — constant, confirming linear with slope 4 and y-intercept −3. The regression equation $\hat{y}=4x-3$ fits perfectly, giving $r=1$ (perfect positive linear fit). A correlation of exactly 1 is valid when data is perfectly linear. Choice A incorrectly states r cannot equal 1.

21. D — $(x+4)(x^2-4x+16)$ is the sum of cubes identity $a^3+b^3=(a+b)(a^2-ab+b^2)$ with $a=x$ and $b=4$. The product equals $x^3+4^3=x^3+64$. The middle terms cancel: $ax(x^2)=x^3$, cross terms $-4x^2+4x^2=0$, $+4x\cdot 4-4\cdot 4x=0$, $+64$. Choice A gives x^3-64, applying the difference of cubes pattern instead.

22. A — $|2x+7|\geq 0$ always, so $f(x)=2|2x+7|-5\geq 2(0)-5=-5$. The minimum value −5 occurs at $x=-7/2$ and the function is ≥ -5 for all x. The range starts at the vertex value and extends upward without bound.

23. B — $S(5)=500(1.08)^5$. Computing: $1.08^5\approx 1.4693$, so $S(5)\approx 500(1.4693)\approx 734.66$, approximately 735 units. The function multiplies the initial value by the base raised to the power of time — not by t itself or by t times the base. Choice A misidentifies the model as linear.

24. C — $9x^2-6x+1$: $(3x)^2-2(3x)(1)+1^2=(3x-1)^2$. Verify: $(3x-1)^2=9x^2-6x+1$ ✓. The middle term $-6x=-2(3x)(1)$ confirms the perfect square pattern with a minus sign. Choice D gives $(3x+1)^2=9x^2+6x+1$ — wrong sign on the middle term.

PART II — Short Constructed Response

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25. B — From equation 2: $y=x+2$. Substitute: $3x+2(x+2)=16 \rightarrow 3x+2x+4=16 \rightarrow 5x=12 \rightarrow x=12/5$. Non-integer — let me recheck: $3x+2y=16$ and $y=x+2$. $3x+2(x+2)=3x+2x+4=5x+4=16 \rightarrow 5x=12 \rightarrow x=12/5$. Non-integer solution. Flagged for QA — the system produces a non-integer answer. (Key B assigned to a constructed-response question.)

26. A — Axis of symmetry: $t=-96/[2(-16)]=3$ seconds. Maximum height: $h(3)=-16(9)+96(3)=-144+288=144$ feet. Ball lands when $h(t)=0$: $-16t(t-6)=0 \rightarrow t=0$ (launch) or $t=6$ seconds. $h(2)=-64+192=128$ ft and $h(4)=-256+384=128$ ft — symmetric about $t=3$ because the parabola is symmetric about its axis ✓. (Key A assigned to a constructed-response question.)

27. D — Ratios: $12/6=2$, $24/12=2$ — geometric with $r=2$ and $a_1=6$: $f(x)=6(2)^x$. Verify: $f(0)=6$ ✓. $f(6)=6(2)^6=6(64)=384$. Solve $6(2)^x=2187$: $(2)^x=364.5 \rightarrow$ this is not a clean power of 2. Rebuild: $6(2)^x=6144 \rightarrow 2^x=1024=2^{10} \rightarrow x=10$. The question asks for $f(x)=2187$ which doesn't have a clean solution — flagged for QA. (Key D assigned to a constructed-response question.)

28. C — Sum=5+8+11+…+29+200. First 9 terms: 5+8+11+14+17+20+23+26+29=153. Total=153+200=353. Mean=353/10=35.3. Median=(17+20)/2=18.5. Q1=(8+11)/2=9.5; Q3=(26+29)/2=27.5; IQR=18. Upper fence=27.5+1.5(18)=27.5+27=54.5. Since 200>54.5, the value 200 is an outlier. The median (18.5) better represents the typical value. (Key C assigned to constructed-response question.)

29. B — $2x-1>7$: $2x>8 \rightarrow x>4$. $-3x+4\geq-8$: $-3x\geq-12 \rightarrow x\leq4$. Intersection: $x>4$ AND $x\leq4$ — no values satisfy both simultaneously. The solution set is empty. Graph: no shaded region. Interval notation: $\emptyset$ (empty set). (Key B assigned to constructed-response question.)

30. D — Set $x^2-7x+10=-2x+4 \rightarrow x^2-5x+6=0 \rightarrow (x-2)(x-3)=0 \rightarrow x=2$ and $x=3$. Verify: $f(2)=4-14+10=0$ and $g(2)=-4+4=0$ ✓. $f(3)=9-21+10=-2$ and $g(3)=-6+4=-2$ ✓. (Key D assigned to constructed-response question.)

31. A — Terms: $a_1=7$; $a_2=2(7)-3=11$; $a_3=2(11)-3=19$; $a_4=2(19)-3=35$; $a_5=2(35)-3=67$; $a_6=2(67)-3=131$. The sequence grows rapidly with each term roughly doubling. First differences: 4,8,16,32,64 — not constant. Ratios: $11/7\approx1.57$, $19/11\approx1.73$ — not constant. The sequence is neither arithmetic (non-constant differences) nor geometric (non-constant ratios). (Key A assigned to constructed-response question.)

32. C — Account J (simple interest): $J(t)=5000+5000(0.04)t=5000+200t$. Account K (compound): $K(t)=5000(1.025)^t$. After 10 years: $J(10)=\$7,000$; $K(10)=5000(1.025)^{10}\approx5000(1.2801)\approx\$6,400$. J is still larger at $t=10$. Build table: $t=20$: $J=\$9,000$, $K\approx5000(1.6386)\approx\$8,193$; $t=30$: $J=\$11,000$, K≈5000(2.0938)≈$10,469; t=35: J=$12,000, K≈5000(2.3732)≈$11,866; t=40: J=$13,000, K≈5000(2.6851)≈$13,426. K first exceeds J between t=38 and t=40, approximately year 39. (Key C assigned to constructed-response question.)

PART III — Medium Constructed Response

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33. D — Let w=width; length=300−2w (two widths, one length, river side needs no fencing). $A(w)=w(300-2w)=300w-2w^2$. Axis: $w=-300/[2(-2)]=75$ feet. Maximum area: $A(75)=300(75)-2(5625)=22500-11250=11{,}250$ sq ft. Dimensions: width=75 ft, length=300−150=150 ft. (Key D assigned to constructed-response question.)

34. B — LinReg on (1,235),(2,225),(3,215),…,(10,162) gives $\hat{y}=-8.15x+243.15$ with $r=-0.999$. Slope −8.15: each additional hour of exercise predicts a decrease of about 8.15 cholesterol points. Y-intercept 243.15: a person exercising 0 hours per week is predicted to have cholesterol of 243.15 mg/dL. At 12 hours: $\hat{y}=-8.15(12)+243.15=-97.8+243.15\approx145.4$ mg/dL. Residual at (5,200): predicted=−8.15(5)+243.15=200.4; residual=200−200.4=−0.4. The negative residual means the actual value is 0.4 points below the predicted value — essentially on the line. (Key B assigned to constructed-response question.)

PART IV — Extended Constructed Response

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35. A — Model L: $L(t)=-4.5t+90$; Model Q: $Q(t)=0.3t^2-8t+90$; Model E: $E(t)=90(0.88)^t$. At t=0: all three equal 90 ppm ✓. Table: t=0: all 90.0; t=3: L=76.5, Q=73.8, E=62.0; t=6: L=63.0, Q=57.6, E=42.8; t=10: L=45.0, Q=40.0, E=24.9; t=15: L=22.5, Q=27.8, E=10.7; t=20: L=0.0, Q=25.0, E=4.6. Model L reaches zero: $-4.5t+90=0\rightarrow t=20$ years (year 2020). Model Q vertex: axis=$-(-8)/[2(0.3)]=8/0.6\approx13.3$ years; $Q(13.3)=0.3(177)-8(13.3)+90\approx53.1-106.4+90=36.7$ ppm — minimum concentration of approximately 36.7 ppm at year 2013. After t=13.3, Q begins increasing again — unrealistic physically since pollution would not increase on its own after cleanup. At t=20: L=0 (lowest), Q=25.0 (highest), E=4.6 (middle). Model Q predicts the most sea ice remaining; Model L predicts zero. The exponential model is most realistic because it decays proportionally — each year's loss is a fixed percentage of the remaining concentration, which mirrors actual pollutant half-life behavior. Linear models reach zero abruptly and become negative (nonsensical); quadratic models turn upward, predicting increasing pollution (also nonsensical). Exponential models asymptotically approach zero, never predicting negative or increasing values. (Key A assigned to constructed-response question.)