PRACTICE EXAM 27

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 linear equations has a slope of −2 and a y-intercept of 7?

A. $y = 7x - 2$

B. $y = 2x + 7$

C. $y = -2x + 7$

D. $y = -7x + 2$

2. A student correctly factors a quadratic and finds zeros at $x = -6$ and $x = 5$. Which of the following was the original quadratic equation (with leading coefficient 1)?

A. $x^2 + x - 30 = 0$

B. $x^2 - x - 30 = 0$

C. $x^2 + 11x - 30 = 0$

D. $x^2 - 11x - 30 = 0$

3. Which of the following correctly states why the number $0.\overline{6}$ (0.666…) is rational?

A. It is rational because it is between 0 and 1

B. It is rational because it only contains the digit 6

C. It is rational because it is close to 2/3, which is rational

D. It is rational because it is a non-terminating repeating decimal equal to 2/3

4. An arithmetic sequence has first term 14 and common difference −5. Which explicit formula is correct?

A. $a_n = 14 - 5n$

B. $a_n = -5n + 19$

C. $a_n = 14 + 5(n - 1)$

D. $a_n = -5(n - 1) + 9$

5. Which of the following is equivalent to $(3x - 2)(x^2 + 4x - 1)$?

A. $3x^3 + 10x^2 - 11x + 2$

B. $3x^3 + 12x^2 - 3x - 2$

C. $3x^3 + 10x^2 - 11x - 2$

D. $3x^2 + 10x - 3$

6. A box plot shows: Min = 18, Q1 = 34, Median = 47, Q3 = 61, Max = 82. Which of the following is correct?

A. The mean is 47 because the median is 47

B. The range is 44 and the IQR is 64

C. The IQR is 27 and the range is 64

D. The distribution is perfectly symmetric about 47

7. The system below has a unique solution. Which ordered pair satisfies both equations?

$x + y = 7$

$3x - 2y = 6$

A. (3, 4)

B. (2, 5)

C. (5, 2)

D. (4, 3)

8. Which of the following correctly rewrites $f(x) = x^2 - 10x + 21$ in factored form?

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

B. $(x - 3)(x - 7)$

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

D. $(x + 21)(x - 1)$

9. A company models monthly revenue as $R(x) = -3x^2 + 120x - 900$, where x is units sold. How many units maximize revenue?

A. 10

B. 15

C. 30

D. 20

10. Which of the following is a correct simplification of $\sqrt{(98x^4y^6)}$?

A. $7x^2y^3\sqrt{2}$

B. $9x^2y^3\sqrt{2}$

C. $14x^2y^3$

D. $7x^2y^2\sqrt{2}$

11. A student uses the regression equation $\hat{y} = -1.4x + 58.2$ to predict that a patient who exercises 5 days per week has a resting heart rate. The actual rate is 54 bpm. What is the residual?

A. −3.2

B. −2.8

C. 2.8

D. 51.2

12. Which of the following correctly describes the solution to the inequality $-2(x - 4) \geq 6$?

A. $x \geq 7$

B. $x \geq 1$

C. $x \leq 7$

D. $x \leq 1$

13. A geometric sequence has $a_1 = 3$ and $r = -4$. What is the value of a_4?

A. 48

B. −192

C. 192

D. −48

14. Two lines are described below. Which statement about them is correct?

Line 1: $3x + 6y = 18$

Line 2: $y = -(1/2)x + 4$

A. The lines are parallel — both have slope $-1/2$ but different y-intercepts

B. The lines are identical — they represent the same equation

C. The lines are perpendicular — their slopes multiply to -1

D. The lines intersect at exactly one point

15. Which of the following correctly identifies a function from a set of ordered pairs?

A. $\{(2, 3), (2, 5), (3, 7)\}$ — $x = 2$ maps to two outputs

B. $\{(0, 1), (0, 2), (1, 3)\}$ — $x = 0$ maps to two outputs

C. $\{(-1, 4), (0, 4), (1, 4)\}$ — every input maps to the same output

D. $\{(1, 2), (2, 4), (3, 6), (1, 8)\}$ — $x = 1$ maps to two outputs

16. Which of the following is the product of $(x + 3)(x - 3)(x^2 + 9)$?

A. $x^4 - 9x^2 - 81$

B. $x^4 + 81$

C. $x^4 - 81$

D. $x^4 + 9x^2 - 81$

17. Which of the following correctly solves the system?

$2x + y = 9$

$x + y = 4$

A. (1, 7)

B. (5, −1)

C. (4, 1)

D. (3, 1)

18. The function f(x) = 4(1/2)^x models the amount of a drug (in mg) remaining after x hours. Which correctly identifies the initial dose and hourly decay rate?

A. Initial dose 2 mg; decays 50% each hour

B. Initial dose 4 mg; decays 4% each hour

C. Initial dose 1/2 mg; decays 4% each hour

D. Initial dose 4 mg; decays 50% each hour

19. Which of the following correctly identifies the vertex of $f(x) = -2x^2 + 8x - 5$?

A. (2, 3)

B. (−2, −29)

C. (4, 11)

D. (2, −5)

20. A survey of 200 high school students asks whether they prefer in-person or online classes, and their grade level.

Grade 9Grade 10TotalIn-Person7050120Online305080Total100100200

What percentage of Grade 10 students prefer online classes?

A. 25%

B. 40%

C. 50%

D. 62.5%

21. Which of the following correctly solves |2x + 7| = 15?

A. x = 11 and x = −4

B. x = 4 and x = −11

C. x = 4 only

D. x = −11 only

22. The function V(t) = 28000(0.82)^t models a vehicle's value in dollars t years after purchase. Which statement is correct?

A. The vehicle loses approximately $28,000 per year in value

B. The vehicle loses 18% of its value each year, starting from $28,000

C. The vehicle retains 18% of its value each year

D. The vehicle gains 18% in value each year

23. Which of the following is the equation of the line passing through (6, −1) and perpendicular to $y = (3/2)x - 4$?

A. $y = (3/2)x - 10$

B. $y = -(2/3)x + 3$

C. $y = -(3/2)x + 8$

D. $y = (2/3)x - 5$

24. Which of the following correctly simplifies $(2x^2 - 18) / (x^2 + 2x - 15)$?

A. $2(x + 3)/(x + 5)$

B. $2(x - 3)/(x - 5)$

C. $(2x - 6)/(x + 5)$

D. $2(x - 3)/(x + 5)$

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

Each question is worth 2 credits. Show all work.

25. A sequence is given: 3, −6, 12, −24, 48, …

a. Identify the type and write the explicit formula.

b. Write the recursive formula.

c. Find a_8 and state whether it is positive or negative.

d. Justify your sign determination algebraically.

26. Two students attempt to solve $2x^2 - 4x - 6 = 0$.

Student A factors: $2(x - 3)(x + 1) = 0$, getting $x = 3$ and $x = -1$.

Student B uses the quadratic formula and gets $x = (4 \pm \sqrt{(16 + 48)})/4 = (4 \pm 8)/4$, getting $x = 3$ and $x = -1$.

a. Verify both solutions in the original equation.

b. Confirm both students are correct.

c. Compute the discriminant and explain what it tells you about the nature of the solutions.

27. The height of a diver above the water is modeled by $h(t) = -16t^2 + 8t + 24$, where t is seconds and h is feet.

a. What is the maximum height and when does it occur?

b. Factor h(t) and find all times when $h = 0$.

c. State the contextually valid time the diver hits the water.

28. A data set is: 6, 10, 15, 21, 28, 36, 45, 55, 66, 170.

a. Compute the mean and median.

b. Determine whether 170 is an outlier using the 1.5 × IQR rule.

c. Explain which measure of center better describes the typical value.

29. Solve the following system and classify it.

$6x - 4y = 12$

$3x - 2y = 6$

30. A student claims: "The expressions $(x + 4)(x - 4)$ and $(x - 4)^2$ are both quadratic, so they must be equivalent." Disprove this claim with an algebraic expansion and a specific numerical counterexample.

31. The function $f(x) = 3x^2 - 12x + 9$ models weekly profit (in hundreds of dollars) for a business.

a. Factor completely and find the zeros.

b. Identify the vertex and state the minimum profit.

c. Determine the domain and range in context (production must be non-negative).

32. Given the functions $f(x) = 4x + 7$ and $g(x) = 2x^2 - x + 1$, find all values of x where $f(x) = g(x)$. Show all algebraic work and verify.

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

Each question is worth 4 credits. Show all work.

33. Two fitness trackers offer different pricing structures.

Tracker A: $85 upfront and $12/month subscription.

Tracker B: No upfront cost but $22/month subscription.

a. Write a cost function for each tracker after m months.

b. For how many months is Tracker A less expensive? Show algebraic work.

c. At what month do both trackers cost the same? Calculate that total cost.

d. A consumer plans to use a tracker for exactly 2 years. Which costs less and by how much?

34. A teacher presents the following three functions and asks students to compare them over the domain $x \geq 0$.

$p(x) = 4x + 10$ (linear)

$q(x) = x^2 + 2x + 10$ (quadratic)

$r(x) = 10(1.5)^x$ (exponential)

a. Evaluate all three functions at $x = 0, 2, 4, 6$.

b. For what x-value (approximately) does r(x) first exceed q(x)? Use a table to identify the interval.

c. For what x-value (approximately) does r(x) first exceed p(x)?

d. Explain why r(x) eventually dominates both p(x) and q(x) for large values of x, referencing growth rate behavior.

PART IV — Extended Constructed Response (Question 35)

This question is worth 6 credits. Show all work.

35. Three investors each start with $8,000 in different accounts. Their balances after t years are modeled as follows:

Investor A (Linear): $A(t) = 600t + 8000$

Investor B (Quadratic): $B(t) = 50t^2 + 400t + 8000$

Investor C (Exponential): $C(t) = 8000(1.07)^t$

a. At t = 0, verify that all three investors start with the same balance. State that balance.

b. Create a table of values at t = 0, 5, 10, 15, 20, and 25. Round to the nearest dollar.

c. For Investor B, find the vertex and explain what it represents. Is the vertex a minimum or a maximum?

d. Using your table, identify approximately when Investor C's balance first exceeds Investor A's and when it first exceeds Investor B's.

e. At t = 25, rank all three balances from smallest to largest. Explain in terms of function type why the exponential model produces the largest long-term balance, and what this means for a real investor choosing between these structure

Practice Exam 27 — Answer Key and Explanations

1. C — Slope-intercept form with slope -2 and y-intercept 7: $y=-2x+7$. The coefficient of x is the slope and the constant term is the y-intercept. Choice A reverses them, using 7 as the slope and -2 as the y-intercept.

2. A — Zeros at $x=-6$ and $x=5$ give factors $(x+6)(x-5)$. Expand: $x^2-5x+6x-30=x^2+x-30=0$. The sum of the roots is $-6+5=-1$, giving the middle coefficient $+1$. Choice B gives x^2-x-30, which has roots $+6$ and -5, not -6 and $+5$.

3. D — A decimal is rational if and only if it terminates or repeats in a fixed cycle. The decimal 0.666… repeats the digit 6 indefinitely in a fixed pattern, making it rational and equal to 2/3. Choice C says "close to" 2/3 — being close to a rational is not the reason; being exactly equal to a fraction of integers is.

4. B — Explicit formula: $a_n=a_1+(n-1)d=14+(n-1)(-5)=14-5n+5=-5n+19$. Verify: $a_1=-5+19=14$ ✓; $a_2=-10+19=9=14-5$ ✓. Choice A gives $a_n=14-5n$ which gives $a_1=9$, not 14.

5. A — Expand $(3x-2)(x^2+4x-1)$: $3x(x^2+4x-1)-2(x^2+4x-1)=3x^3+12x^2-3x-2x^2-8x+2=3x^3+10x^2-11x+2$. Combine middle terms: $12x^2-2x^2=10x^2$ and $-3x-8x=-11x$. Choice B incorrectly gives $+12x^2-3x$, missing the $-2x^2$ and $-8x$ contributions from the second term.

6. C — IQR=Q3−Q1=61−34=27. Range=Max−Min=82−18=64. Both values are correct in choice C. Choice B reverses them — stating range=44 and IQR=64, which confuses the two measures. Choice A cannot be verified from a box plot (mean requires all data values).

7. D — Set equations equal: $x+y=7$ and $3x-2y=6$. From eq 1: $y=7-x$. Substitute: $3x-2(7-x)=6\rightarrow 3x-14+2x=6\rightarrow 5x=20\rightarrow x=4$, $y=3$. Verify: $4+3=7$ ✓ and $12-6=6$ ✓. Choice A: $3+4=7$ ✓ but $3(3)-2(4)=9-8=1\neq 6$ ✗.

8. B — For $x^2-10x+21$: find two numbers with product 21 and sum −10: −3 and −7. Factored form: $(x-3)(x-7)$. Verify: $(x-3)(x-7)=x^2-10x+21$ ✓. Choice A uses positive signs, giving $(x+3)(x+7)=x^2+10x+21$ — wrong sign on the middle term.

9. D — Axis of symmetry: $x=-120/[2(-3)]=120/6=20$ units. Maximum revenue occurs at $x=20$. Verify: $R(20)=-3(400)+120(20)-900=-1200+2400-900=300$. Choice C ($x=30$) gives $R(30)=-3(900)+3600-900=-2700+3600-900=0$ — the break-even point, not the maximum.

10. A — $\sqrt{(98x^4y^6)}=\sqrt{(49\cdot2\cdot x^4\cdot y^6)}=7\cdot\sqrt{2}\cdot x^2\cdot y^3=7x^2y^3\sqrt{2}$. Each perfect square factor is extracted: $\sqrt{49}=7$, $\sqrt{x^4}=x^2$, $\sqrt{y^6}=y^3$. Choice D incorrectly uses x^2 rather than x^2 — wait, choice D gives $7x^2y^2\sqrt{2}$ which uses y^2 instead of y^3 (incorrectly halving 6 to 2 rather than 3).

11. C — Predicted at $x=5$: $\hat{y}=-1.4(5)+58.2=-7+58.2=51.2$ bpm. Actual=54 bpm. Residual=$54-51.2=2.8$. A positive residual means the actual heart rate was above the model's prediction. Choice A (−3.2) has the wrong sign and magnitude.

12. D — Solve $-2(x-4)\geq6$: distribute: $-2x+8\geq6$; subtract 8: $-2x\geq-2$; divide by −2 and reverse: $x\leq1$. The inequality reverses when dividing by negative. Verify: at $x=0$: $-2(-4)=8\geq6$ ✓; at $x=2$: $-2(-2)=4\geq6$ ✗. Choice A ($x\geq7$) results from forgetting the reversal.

13. B — $a_4=3(-4)^{(4-1)}=3(-4)^3=3(-64)=-192$. Odd exponents preserve the negative sign of the base: $(-4)^3=-64$. Verify: $a_1=3$, $a_2=-12$, $a_3=48$, $a_4=-192$ ✓. Choice C gives +192, incorrectly treating $(-4)^3$ as positive.

14. A — Rewrite Line 1: $3x+6y=18 \rightarrow y=-(1/2)x+3$. Slope=−1/2. Line 2: $y=-(1/2)x+4$. Slope=−1/2. Both have slope −1/2 but y-intercepts 3 and 4 — they are parallel, never intersecting. Choice B would require the lines to be identical (same y-intercept), which they are not.

15. C — A function requires each input to map to exactly one output. $\{(-1,4),(0,4),(1,4)\}$: three distinct inputs (−1,0,1) each mapping to 4. Repeated outputs are allowed — only repeated inputs with different outputs disqualify a function. All other choices (A, B, D) contain an x-value paired with two different y-values.

16. C — $(x+3)(x-3)=x^2-9$ (difference of squares). Then $(x^2-9)(x^2+9)=x^4-81$ (another difference of squares). Both applications eliminate middle terms. Choice A gives x^4-9x^2-81, which is incorrect — the cross term would require a sum, not a product pattern.

17. B — From eq 2: $y=4-x$. Substitute into eq 1: $2x+(4-x)=9\rightarrow x+4=9\rightarrow x=5$, $y=-1$. Verify: $2(5)+(-1)=9$ ✓ and $5+(-1)=4$ ✓. Choice C: $2(4)+1=9$ ✓ but $4+1=5\neq4$ ✗.

18. D — Initial value at $x=0$: $f(0)=4(1/2)^0=4(1)=4$ mg. Base $1/2=1-1/2$ means 50% is lost each hour (decay rate=50%). Choice B gives only 4% per hour, misreading 0.5 as 0.04 rather than understanding the decay rate is $1-0.5=50\%$.

19. A — Axis of symmetry: $x=-8/[2(-2)]=2$. Vertex: $f(2)=-2(4)+8(2)-5=-8+16-5=3$. Vertex: (2,3). Choice B gives (−2,−29), resulting from using $+8/[2(-2)]=-2$ as the axis — incorrect sign application.

20. C — Of 100 Grade 10 students, 50 prefer online: 50/100=50%. The conditional frequency divides by the column total (100), not the grand total (200). Choice A (25%) would equal 50/200, using the wrong denominator.

21. B — $2x+7=15 \rightarrow x=4$ and $2x+7=-15 \rightarrow 2x=-22 \rightarrow x=-11$. Verify: $|2(4)+7|=|15|=15$ ✓ and $|2(-11)+7|=|-15|=15$ ✓. Choice A gives x=11 and x=−4, which would come from $|2x+7|=15$ being solved with the wrong case setup ($x+7=\pm 15$ rather than $2x+7=\pm 15$).

22. D — In V(t)=28000(0.82)^t, the base 0.82=1−0.18 means 18% of value is lost each year (decay rate=18%) while 82% is retained. Choice C reverses this — stating the vehicle retains only 18% (which would mean 82% loss annually, far too fast).

23. B — Perpendicular to $y=(3/2)x-4$ requires slope=−2/3. Using (6,−1): $y+1=-(2/3)(x-6) \rightarrow y=-(2/3)x+4-1=-(2/3)x+3$. Verify: $f(6)=-4+3=-1$ ✓. Choice C uses slope −3/2 (parallel to original, not perpendicular).

24. A — Numerator: $2x^2-18=2(x^2-9)=2(x-3)(x+3)$. Denominator: $x^2+2x-15=(x+5)(x-3)$. Cancel (x−3): result=2(x+3)/(x+5). Undefined when x=3 (cancelled) and x=−5. Choice D gives 2(x−3)/(x+5), using the wrong factor from the numerator after cancellation.

25. D — From equation 2: y=8−5x. Substitute into equation 1: $3x+2(8-5x)=16 \rightarrow 3x+16-10x=16 \rightarrow -7x=0 \rightarrow x=0$, y=8. Verify: 3(0)+2(8)=16 ✓ and 5(0)+8=8 ✓. Solution: (0,8). (Key D assigned to constructed-response question.)

26. C — Axis: $t=-8/[2(-16)]=1/4$... wait — $h(t)=-16t^2+8t+24$. Axis=$-8/[2(-16)]=8/32=0.25$ seconds. Maximum: $h(0.25)=-16(0.0625)+8(0.25)+24=-1+2+24=25$ feet. Factor: $-16t^2+8t+24=-8(2t^2-t-3)=-8(2t-3)(t+1)$. Zeros: t=3/2=1.5 and t=−1 (reject). The diver hits the water at t=1.5 seconds. (Key C assigned to constructed-response question.)

27. D — Ratios: 9/3=3, 27/9=3 — geometric: p(x)=3^x. p(6)=3^6=729. Solve p(x)=2187: $3^x=2187=3^7 \rightarrow x=7$. (Key D assigned to constructed-response question.)

28. B — Sum=6+10+15+21+28+36+45+55+66+170=452. Mean=452/10=45.2. Median=(28+36)/2=32. Q1=(10+15)/2=12.5; Q3=(55+66)/2=60.5; IQR=48. Upper fence=60.5+1.5(48)=60.5+72=132.5. Since 170>132.5, the value 170 is an outlier. The median (32) better represents the typical value because the mean (45.2) is pulled upward by 170. (Key B assigned to constructed-response question.)

29. A — From eq 2: x=2y+5. Substitute: $3(2y+5)-6y=12 \rightarrow 6y+15-6y=12 \rightarrow 15=12$. Contradiction — the system is inconsistent with no solution. The lines are parallel (same slope, different intercepts). (Key A assigned to constructed-response question.)

30. B — Factor: $3x^2-12x+9=3(x^2-4x+3)=3(x-3)(x-1)$. Zeros: x=3 and x=1 — the business breaks even at 1 and 3 units. Axis: x=2; vertex: $f(2)=3(4)-24+9=12-24+9=-3$. Minimum profit of −$300 at x=2 units (a loss). (Key B assigned to constructed-response question.)

31. C — C_A(m)=85+12m; C_B(m)=22m. Set equal: 85+12m=22m→85=10m→m=8.5 months. For months <8.5, Tracker A costs more (higher upfront); after 8.5 months, Tracker A costs less (lower monthly). Tracker A is less expensive from month 9 onward. At 24 months: C_A=85+288=$373; C_B=22(24)=$528. Tracker A costs $155 less over 2 years. (Key C assigned to constructed-response question.)

32. D — Table: x=0: p=10,q=10,r=10; x=2: p=18,q=18,r=22.5; x=4: p=26,q=42,r=50.6; x=6: p=34,q=70,r=113.9. r first exceeds q between x=3 and x=4 (r(3)=33.75, q(3)=25; r(3)>q(3)). r first exceeds p between x=1 and x=2 (r(1)=15>p(1)=14). r(x) eventually dominates because each step multiplies by 1.5 (constant factor), while p adds 4 and q adds an increasing quadratic amount — multiplicative growth always outpaces additive growth for sufficiently large x. (Key D assigned to constructed-response question.)

33. A — C_A(t)=600t+8000; $C_B(t)=50t^2+400t+8000$; C_C(t)=8000(1.07)^t. At t=0: all equal $8,000 ✓. Table: t=0: all 8000; t=5: A=11000, B=12000, C=11224; t=10: A=14000, B=19000, C=15737; t=15: A=17000, B=28250, C=22076; t=20: A=20000, B=40000, C=30937; t=25: A=23000, B=54125, C=43380. C first exceeds A between t=9 and t=10 (C(9)≈14759, A(9)=13400; C>A). C first exceeds B between t=22 and t=23 (C(22)≈36440, B(22)=50800 — B still larger; C(25)=43380<B(25)=54125 — B still larger). At t=25: A=23000 (smallest), B=54125 (largest), C=43380 (middle). The exponential model grows fastest long-term because each year the balance multiplies by 1.07 — 7% of an ever-growing balance adds more each year than a fixed $600 or an accelerating quadratic addition. A real investor should note that the quadratic model B actually dominates for the first 25 years, while exponential C only surpasses linear A around year 10. Choosing between them depends on the time horizon. (Key A assigned to constructed-response question.)

34. B — Table: x=0: p=10,q=10,r=10; x=2: p=18,q=18,r=22.5; x=4: p=26,q=42,r=50.6; x=6: p=34,q=70,r=113.9. r exceeds p between x=1 and x=2. r exceeds q between x=3 and x=4 (at x=3: r(3)=33.75, q(3)=2(9)+20(3)+100=18+60+100=178 — r(3)<q(3)). Wait — r(3)=10(1.5)^3=10(3.375)=33.75 and q(3)=2(9)+60+100=178. r is much smaller than q at x=3. The crossing must happen much later. At x=6: r=113.9, q=2(36)+120+100=72+120+100=292. At x=10: r=10(1.5)^10≈57.67, q=2(100)+200+100=500. Still q>r. At x=15: r=10(1.5)^15≈437.9, q=2(225)+300+100=850. At x=20: r=10(1.5)^20≈3325, q=2(400)+400+100=1300. r first exceeds q between x=19 and x=20. (Key B assigned to constructed-response question.)

35. C — At t=0: A(0)=8000 ✓; B(0)=8000 ✓; C(0)=8000 ✓. Table (rounded): t=0: all 8000; t=5: A=11000, B=12000, C=11224; t=10: A=14000, B=19000, C=15737; t=15: A=17000, B=28250, C=22076; t=20: A=20000, B=40000, C=30937; t=25: A=23000, B=54125, C=43380. B vertex: axis=−400/[2(50)]=−4; since t≥0 and a=50>0, Model B opens upward with minimum at t=−4 (before the observation window). Within the domain t≥0, B is always increasing — there is no practical minimum in the investment period. C first exceeds A near t=9–10; C never exceeds B within 25 years (B=54125 > C=43380 at t=25). At t=25: A=23000 (smallest), C=43380 (middle),

B=54125 (largest). The exponential model grows fastest because 7% compounding applies to an ever-increasing base — each year's interest is 7% of a larger amount than the year before. Linear A adds $600 regardless of balance; quadratic B's growth accelerates but algebraically, the t^2 term eventually loses to an exponential base >1. For real investors, the quadratic outperforms the exponential within the first 25 years, but the exponential would dominate for time horizons beyond approximately 30–40 years. (Key C assigned to constructed-response question.)