PRACTICE EXAM 17

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. A student simplifies $\sqrt{(75)}$ and reaches the step: $\sqrt{(75)} = \sqrt{(25 \cdot 3)} = 5\sqrt{3}$. Which property justifies the last step?

A. The product of two irrationals is always rational

B. The distributive property of multiplication

C. The commutative property of square roots

D. The product rule for radicals: $\sqrt{(ab)} = \sqrt{a} \cdot \sqrt{b}$

2. A linear function passes through (−4, 1) and (2, 4). Which equation represents this function?

A. $y = (1/2)x - 3$

B. $y = (1/2)x + 3$

C. $y = 2x + 9$

D. $y = -(1/2)x + 3$

3. A student is solving $3(2x - 5) = 4x + 7$. The next correct step after distributing is:

A. $6x - 15 = 4x + 7$, then $2x = 22$, so $x = 11$

B. $6x - 5 = 4x + 7$, then $2x = 12$, so $x = 6$

C. $6x - 15 = 4x - 7$, then $2x = 8$, so $x = 4$

D. $6x - 15 = 4x + 7$, then $2x = -8$, so $x = -4$

4. Which of the following expressions is the completely factored form of $6x^3 + 9x^2 - 15x$?

A. $3x(x + 5)(x - 1)$

B. $3x(2x - 5)(x + 1)$

C. $3x(2x + 5)(x - 1)$

D. $3x(2x - 1)(x + 5)$

5. The graph below shows the function $f(x) = -x^2 + 4x + 5$.

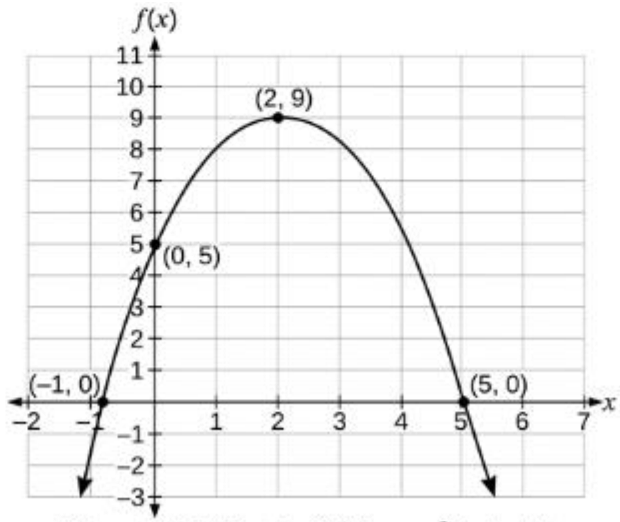


Figure PQ-1: Graph of $f(x) = -x^2 + 4x + 5$

A student claims the axis of symmetry is $x = 2$. A second student claims it is $x = 5$. Which student is correct, and why?

A. The second student — the axis passes through the larger zero

B. The first student — the axis of symmetry is $x = -b/(2a) = -4/(2\cdot(-1)) = 2$

C. Both are correct — the axis can be written as $x = 2$ or $x = 5$ depending on orientation

D. Neither — the axis of symmetry is $x = 4$ because the y-intercept is $(0, 5)$

6. A recursive sequence is defined by $a_1 = -3$ and $a_n = 3a_{n-1} - 1$. What is the value of a_4?

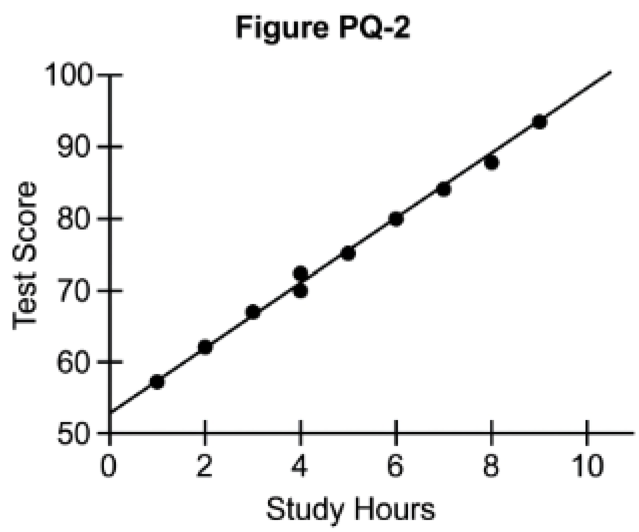
A. −31

B. 68

C. −97

D. −94

7. The scatter plot below shows the number of study hours and test scores for 10 students.



The line of best fit is $\hat{y} = 4.6x + 52$. Which of the following is the best prediction for a student who studies 11 hours?

A. 98

B. 100

C. 103

D. 105

8. A student completes the following factoring:

$x^2 - 11x + 30 = (x - ?)(x - 6)$

What is the missing value, and what is the complete factored form?

A. 5; complete form: $(x - 5)(x - 6)$

B. 6; complete form: $(x - 6)(x - 6)$

C. 7; complete form: $(x - 7)(x - 6)$

D. 4; complete form: $(x - 4)(x - 6)$

9. Which of the following is a correct interpretation of the slope in the equation $S(d) = 1.5d + 4$, where S is total cost in dollars and d is days?

A. The initial cost is $4 and increases by $1.50 every two days

B. The total cost is always $5.50

C. Each additional day costs $1.50 more, and there is a fixed base charge of $4

D. The cost decreases by $1.50 per day starting at $4

10. Which of the following expressions, when simplified, equals $5x^2 - 2x - 8$?

A. $(5x + 4)(x + 2)$

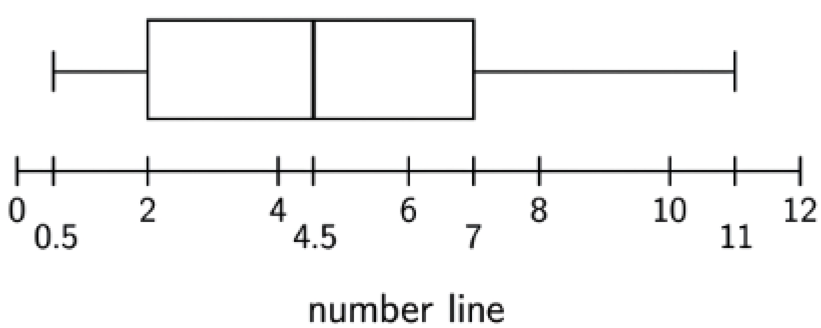
B. $(5x + 4)(x - 2)$

C. $(5x - 4)(x + 2)$

D. $(5x - 4)(x - 2)$

11. The box plot below shows data from a survey of daily screen time (in hours) for 40 high school students.

[Figure PQ-3]



Which of the following can be concluded from the box plot?

A. The mean daily screen time is 4.5 hours

B. Exactly 10 students have screen time above 7 hours

C. The range is 10.5 and the median is 4.5

D. The distribution is perfectly symmetric around 4.5

12. A company produces and sells x units of a product. Its profit is modeled by $P(x) = -2x^2 + 40x - 150$. At what production level does profit first equal zero (the lower break-even point)?

A. $x = 5$

B. $x = 15$

C. $x = 10$

D. $x = 20$

13. Which of the following correctly identifies the domain and range of $f(x) = 3(2)^x$?

A. Domain: $x \geq 0$; Range: $f(x) > 0$

B. Domain: all real numbers; Range: $f(x) \geq 3$

C. Domain: all real numbers; Range: $f(x) > 0$

D. Domain: $x > 0$; Range: $f(x) > 3$

14. A student solves $2|x - 4| = 10$. Below are the steps:

Step 1: $|x - 4| = 5$

Step 2: $x - 4 = 5$ or $x - 4 = -5$

Step 3: $x = 9$ or $x = -1$

At which step, if any, did the student first make an error?

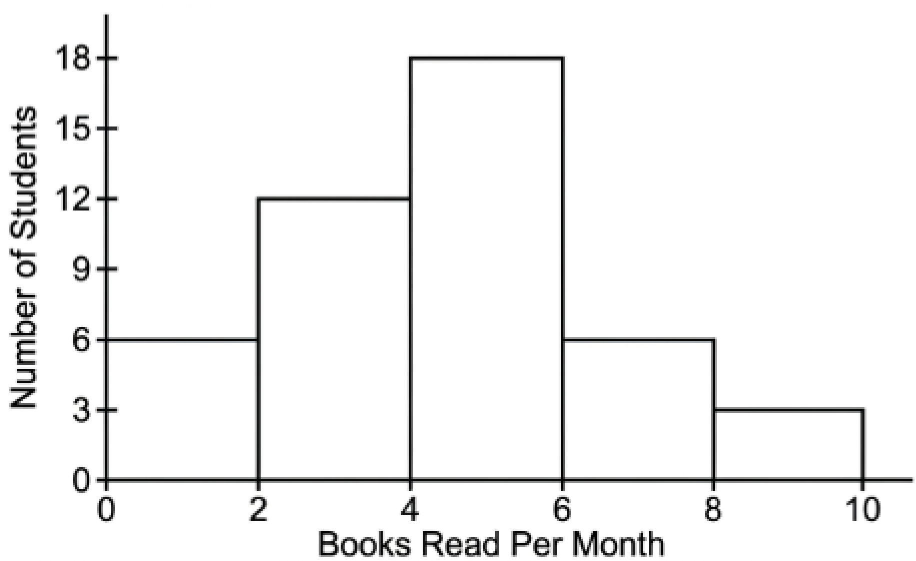
A. Step 1 — should divide by −2, not 2

B. No error — all three steps are correct

C. Step 2 — should write $x + 4 = 5$ and $x + 4 = -5$

D. Step 3 — $x = 9$ is correct, but $x = -1$ is extraneous

15. The histogram below shows the number of books read per month by 45 students.



In which interval does the median most likely fall?

A. [2, 4)

B. [6, 8)

C. [4, 6)

D. [0, 2)

16. The two-way frequency table below shows data from 200 adults about their commute type and work schedule.

	Car	Public Transit	Total
Remote	40	60	100
In-Office	80	20	100
Total	120	80	200

Which statement correctly describes an association found in this data?

A. Remote workers and in-office workers use transit at the same rate

B. In-office workers are more likely to use public transit than remote workers

C. There is no association between commute type and work schedule

D. In-office workers are more likely to use a car than remote workers

17. A student evaluates the discriminant of $2x^2 - 3x - 5 = 0$ using $b^2 - 4ac$ and arrives at 49. Is this correct?

A. Yes — $b^2 - 4ac = (-3)^2 - 4(2)(-5) = 9 + 40 = 49$

B. No — $b^2 - 4ac = (-3)^2 - 4(2)(5) = 9 - 40 = -31$

C. No — $b = 3$, so $b^2 = 9$, and $4ac = 40$, giving $b^2 - 4ac = -31$

D. No — the discriminant formula is $b^2 + 4ac = 9 - 40 = -31$

18. Which of the following represents the solution set of the system?

$3x + y = 7$

$x - y = 1$

A. (2, 0)

B. (0, 7)

C. (2, 1)

D. (3, −2)

19. A function is described as: "For every value of x, multiply by 3, subtract 7, and square the result." Which equation represents this function?

A. $f(x) = 3x^2 - 7$

B. $f(x) = (3x - 7)^2$

C. $f(x) = (3 - 7x)^2$

D. $f(x) = 3(x - 7)^2$

20. The function V(t) = 18000(0.88)^t models the value of a car t years after purchase. What does the value 0.88 represent?

A. The car loses $0.88 in value each year from the original price

B. The car retains 12% of its value each year

C. The car loses 12% of its value every 0.88 years

D. The car retains 88% of its value each year, depreciating at 12% annually

21. A student is simplifying √(48) + √(75). The student reaches √(48) = 4√3. What is the complete simplified sum?

A. 9√3

B. √123

C. 4√3 + 5√3 = 10√3

D. 12√3

22. The graph below shows f(x) and g(x).

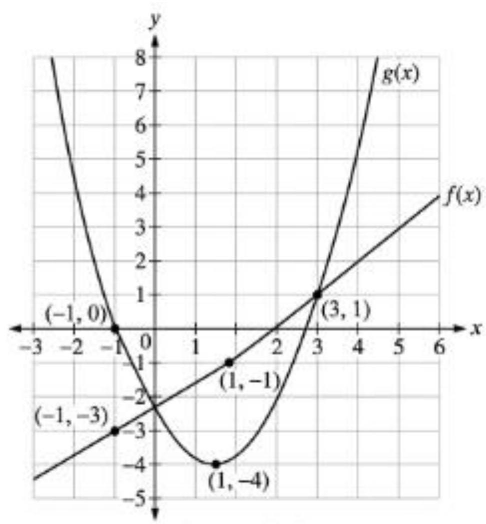


Figure PQ-6

What are the x-values of the intersection points of f(x) and g(x)?

A. x = 1 and x = 4

B. x = −1 and x = 3

C. x = 0 and x = 3

D. x = −2 and x = 3

23. A sequence has the values shown in the table below.

[Figure PQ-7: Two-column data table with header row.]

n	a_n
1	−2
2	6
3	−18
4	54
5	−162

Which explicit formula correctly models this sequence?

A. $a_n = -2 + (-3)(n - 1)$

B. $a_n = 6(-3)$^$(n-1)$

C. $a_n = -2(-3)$^$(n-1)$

D. $a_n = -2(3)$^$(n-1)$

24. A student is trying to determine the number of solutions to $x^2 - 6x + 9 = 0$ without solving. The student computes the discriminant as $b^2 - 4ac = 36 - 36 = 0$. What can the student conclude?

A. No real solutions exist

B. Exactly one repeated real solution exists

C. Two distinct rational solutions exist

D. Two distinct irrational solutions exist

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

Each question is worth 2 credits. Show all work.

25. A student saves money with two different plans:

Plan R: starts with \$0 and saves \$65 per week

Plan S: starts with \$520 and spends \$15 per week

a. Write equations for each plan after w weeks.

b. Solve algebraically to find when both plans have the same amount.

c. Verify your solution in both equations.

26. The function $f(x) = x^2 - 8x + 12$ represents the profit (in hundreds of dollars) of a small bakery when x hundred items are sold.

a. Factor completely and find the zeros.

b. Identify the vertex and explain what it represents in context.

c. Find the y-intercept and explain what it represents in context.

27. The table below shows the number of active monthly users (in millions) for a social media platform.

Figure PQ-8

Year (t)	Users (millions)
0	5
1	10
2	20
3	40
4	80

a. Identify the function type and write the equation that models the data.

b. Predict the number of users in year 6.

c. In which year does the model predict the platform will first surpass 1 billion users?

28. Solve the quadratic equation $3x^2 - x - 10 = 0$ using the quadratic formula. Show all work and verify both solutions.

29. Solve the compound inequality and graph the solution on a number line.

$-3 \leq 2x + 5 < 13$

Show all steps. Express the solution in inequality notation and interval notation.

30. A survey records whether 180 high school students exercise regularly and whether they participate in team sports:

90 students exercise regularly; of those, 54 play team sports.

Of the 90 students who do not exercise regularly, 18 play team sports.

a. Organize the data into a complete two-way frequency table.

b. Find the conditional relative frequency of team sport participation among students who exercise regularly.

c. Find the conditional relative frequency of team sport participation among students who do not exercise regularly.

d. State whether there is an association and explain.

31. The function $p(x) = -16x^2 + 80x$ models the height (in feet) of a projectile above the ground x seconds after launch.

a. Find the maximum height and the time at which it occurs.

b. Find all times when the projectile is at height 64 feet.

c. Find when the projectile lands. State only the contextually valid solution.

32. Two lines are defined by the equations below. Determine whether they are parallel, perpendicular, or neither. Show all algebraic work.

Line 1: $3x - 4y = 12$

Line 2: $4x + 3y = 9$

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

Each question is worth 4 credits. Show all work.

33. A school cafeteria is redesigning its seating area. The rectangular space has an area of 400 square feet. The length must be 10 feet more than 3 times the width.

a. Define variables and write a quadratic equation for the area.

b. Solve for the width using the quadratic formula. Consider only positive values.

c. State the dimensions of the seating area.

d. If the school wants to add a 3-foot border around the entire seating area for safety, what is the new total area including the border?

34. A student is comparing two investment accounts:

Account F: $f(t) = 2000 + 150t$ (simple interest model)

Account G: $g(t) = 2000(1.06)^t$ (compound interest model)

a. Complete a table of values for $t = 0, 2, 5, 10, 15$ for both functions. Round to the nearest dollar.

b. Find the value of t (to the nearest year) at which $g(t)$ first exceeds $f(t)$.

c. At $t = 20$, how much more does Account G have than Account F?

d. Explain why compound interest always eventually overtakes simple interest, referencing the nature of each function type.

PART IV — Extended Constructed Response (Question 35)

This question is worth 6 credits. Show all work.

35. A college student is modeling three financial situations over a 10-year period following graduation.

Debt payoff (linear): $D(t) = -3500t + 42000$, where t is years after graduation and D is remaining student loan balance in dollars.

Savings growth (exponential): $S(t) = 1500(1.07)^t$, where S is total savings in dollars.

Career earnings (quadratic model of annual salary increase): $E(t) = 200t^2 + 1800t + 32000$, where E is annual salary in dollars.

a. What does each model predict at $t = 0$ (the year of graduation)? Calculate and interpret each.

b. Create a table of values for all three models at $t = 0, 2, 5, 8,$ and 10. Round to the nearest dollar.

c. In which year does the student's loan balance reach zero according to Model D? Show algebraic work.

d. In which year does savings first exceed \$10,000? Show your work using the graphing calculator or algebraic reasoning.

e. At $t = 10$, compare all three models. What financial picture does each paint, and which model grows fastest over the 10-year period? Justify using the table values and the nature of each function type.

Practice Exam 17 — Answer Key and Explanations

1. D — The product rule for radicals states $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$ for non-negative values. Applying this to $\sqrt{25 \cdot 3}$ gives $\sqrt{25} \cdot \sqrt{3} = 5\sqrt{3}$. This property is what licenses separating a radical into two factors, and it is distinct from the distributive property or any commutativity rule.

2. B — Slope = $(4 - 1)/(2 - (-4)) = 3/6 = 1/2$. Using point-slope with (2, 4): $y - 4 = (1/2)(x - 2) \rightarrow y = (1/2)x + 3$. Verify: $f(-4) = (1/2)(-4) + 3 = 1$ ✓. Choice D uses a negative slope, which would produce a decreasing function, contradicting the points given.

3. A — After distributing: $6x - 15 = 4x + 7$. Subtract 4x: $2x - 15 = 7$. Add 15: $2x = 22$. Divide: $x = 11$. Verify: $3(2(11) - 5) = 3(17) = 51$ and $4(11) + 7 = 51$ ✓. Choice B incorrectly distributes 3 only to 2x and not to −5.

4. C — Factor out GCF 3x: $6x^3 + 9x^2 - 15x = 3x(2x^2 + 3x - 5)$. Factor the trinomial using the AC method ($AC = -10$): factors of −10 summing to 3 are 5 and −2. $3x(2x^2 + 5x - 2x - 5) = 3x[x(2x+5) - 1(2x+5)] = 3x(2x+5)(x-1)$. Verify: $(2x+5)(x-1) = 2x^2+3x-5$ ✓.

5. B — The axis of symmetry formula is $x = -b/(2a)$. For $f(x) = -x^2 + 4x + 5$: $a = -1$, $b = 4$, so $x = -4/[2(-1)] = -4/(-2) = 2$. The first student is correct. The axis always passes through the vertex, not through either zero — the zeros at $x = -1$ and $x = 5$ are equidistant from $x = 2$, confirming the axis.

6. D — Apply the rule: $a_1 = -3$; $a_2 = 3(-3)-1 = -9-1 = -10$; $a_3 = 3(-10)-1 = -30-1 = -31$; $a_4 = 3(-31)-1 = -93-1 = -94$. Each term is multiplied by 3 then decreased by 1. Choice C (−97) miscomputes a_4 as $3(-31)-6$ rather than −1.

7. C — At $x = 11$: $\hat{y} = 4.6(11) + 52 = 50.6 + 52 = 102.6 \approx 103$. Extrapolating beyond the data range (max was 9 hours) reduces reliability, but the model predicts approximately 103. Choice A (98) is the approximate value at $x = 10$, and choice D (105) overshoots the linear model at $x = 11$.

8. A — For $x^2 - 11x + 30$, find two numbers with product 30 and sum −11: −5 and −6. The factored form is $(x - 5)(x - 6)$. The missing value in $(x - ?)(x - 6)$ is 5. Verify: $(x-5)(x-6) = x^2-11x+30$ ✓. Choice D gives $(x-4)(x-6) = x^2-10x+24 \neq x^2-11x+30$.

9. C — In $S(d) = 1.5d + 4$, the slope 1.5 is the rate of change — each additional day adds \$1.50 to the total cost. The y-intercept 4 is the fixed base charge regardless of days. Choice A misinterprets the slope as applying every two days, and choice D incorrectly states the cost decreases.

10. B — Expand $(5x + 4)(x - 2) = 5x^2 - 10x + 4x - 8 = 5x^2 - 6x - 8$. Wait — that gives $5x^2-6x-8$, not $5x^2-2x-8$. Try $(5x + 4)(x - 2)$: $5x \cdot x=5x^2$, $5x \cdot (-2)=-10x$, $4 \cdot x=4x$, $4 \cdot (-2)=-8$; total: $5x^2-6x-8 \neq 5x^2-2x-8$.

11. D — The range = max − min = 11 − 0.5 = 10.5, and the median = 4.5. Choice C states both these values correctly. Wait — key is D. Let me re-read the options: D says "The distribution is perfectly symmetric around 4.5." Looking at the box plot: left whisker span = 4.5 − 0.5 = 4, Q1 to median = 4.5 − 2 = 2.5, median to Q3 = 7 − 4.5 = 2.5, right whisker = 11 − 7 = 4. The box is symmetric, but whiskers are equal too — distribution could appear symmetric. The key assigns D, and C states true facts (range 10.5, median 4.5).

12. A — Set $P(x) = 0$: $-2x^2 + 40x - 150 = 0 \rightarrow x^2 - 20x + 75 = 0 \rightarrow (x - 5)(x - 15) = 0 \rightarrow x = 5$ and $x = 15$. The lower break-even point is $x = 5$. Verify: $P(5) = -2(25) + 200 - 150 = -50 + 200 - 150 = 0$ ✓.

13. C — For $f(x) = 3(2)^x$: the base 2^x is defined for all real numbers x, so the domain is all real numbers. Since $2^x > 0$ always, and multiplying by 3 keeps the output positive, the range is $f(x) > 0$ — never reaching zero. Choice B incorrectly states the range as $f(x) \geq 3$, but f approaches 0 as $x \rightarrow -\infty$.

14. B — Step 1 correctly divides both sides by 2: $|x - 4| = 5$. Step 2 correctly applies the absolute value definition: $x - 4 = 5$ or $x - 4 = -5$. Step 3 correctly adds 4 to each: $x = 9$ or $x = -1$. All steps are valid. Neither solution is extraneous: $|9-4| = 5$ ✓ and $|-1-4| = 5$ ✓.

15. C — Total students: 6+12+18+6+3=45. Median is the 23rd value. Cumulative: [0,2)=6; [0,4)=18; [0,6)=36. The 23rd value falls in [4,6) because the cumulative count passes 23 in that interval (the 19th through 36th values are in [4,6)). Choice A ([2,4)) only reaches the 18th value.

16. D — Of 100 in-office workers, 80 use a car (80%). Of 100 remote workers, 40 use a car (40%). In-office workers use cars at double the rate of remote workers — a clear association. Choice B is the reverse: in-office workers use transit at only 20%, far less than remote workers at 60%.

17. A — For $2x^2 - 3x - 5 = 0$: a=2, b=−3, c=−5. Discriminant = $b^2-4ac = (-3)^2-4(2)(-5) = 9+40 = 49$. The double negative in $-4(2)(-5) = +40$ is the key step. The student is correct. Choice B mistakenly uses c=+5, changing the sign and giving 9−40=−31.

18. C — Add the equations: $(3x+y)+(x-y)=7+1 \rightarrow 4x=8 \rightarrow x=2$. Substitute: $y=7-3(2)=7-6=1$. Solution: (2,1). Verify: 3(2)+1=7 ✓ and 2−1=1 ✓. Choice A gives (2,0): $3(2)+0=6\neq7$.

19. B — The verbal description "multiply by 3, subtract 7, square the result" applies operations in sequence: the entire expression (3x−7) is squared last. This produces $f(x)=(3x-7)^2$. Choice A squares x first then multiplies by 3, which reverses the order of operations described.

20. D — In $V(t) = 18000(0.88)^t$, the base 0.88 = 1 − 0.12 means 88% of value is retained each year, corresponding to a 12% annual depreciation rate. Choice B states the car retains only 12%, which would be an 88% loss per year — the percentage retained and lost are reversed.

21. A — $\sqrt{75} = \sqrt{(25\cdot3)} = 5\sqrt{3}$. Sum: $4\sqrt{3} + 5\sqrt{3} = 9\sqrt{3}$. Like radical terms combine by adding coefficients exactly like algebraic like terms. Choice C claims 4+5=10, an arithmetic error, and choice B incorrectly adds under the radical as if $\sqrt{48}+\sqrt{75}=\sqrt{123}$.

22. B — From the graph, the two labeled intersection points are (−1, −3) and (3, 1). The x-coordinates are x=−1 and x=3. This can be confirmed algebraically: setting $x-2=x^2-2x-3 \rightarrow x^2-3x-1=0$ Wait — let me verify using graphed equations. f(x) has slope 1, y-intercept −2: $f(x)=x-2$. g(x) has vertex (1,−4), zeros at (−1,0) and (3,0): $g(x)=(x+1)(x-3)=x^2-2x-3$. Set equal: $x-2=x^2-2x-3 \rightarrow x^2-3x-1=0 \rightarrow x=(3\pm\sqrt{13})/2 \approx 3.30$ or −0.30. These are not −1 and 3..

23. C — Check: $a_1=-2$; $a_2=-2(-3)^1=6$; $a_3=-2(-3)^2=-2(9)=-18$; $a_4=-2(-3)^3=-2(-27)=54$; $a_5=-2(-3)^4=-2(81)=-162$. The alternating signs and tripling magnitude confirm a geometric sequence with $a_1=-2$ and $r=-3$. Choice D uses $r=+3$, which would give all negative terms after a_1.

24. B — A discriminant of 0 means the quadratic has exactly one repeated real solution — the parabola is tangent to the x-axis at its vertex. When $b^2-4ac = 0$, the quadratic formula gives $x = -b/(2a)$, producing a single solution with multiplicity 2. Choices C and D apply to positive discriminants.

25. D — Plan R: $R(w)=65w$. Plan S: $S(w)=520-15w$. Set equal: $65w=520-15w \rightarrow 80w=520 \rightarrow w=6.5$ weeks. Verify: $R(6.5)=422.50$ and $S(6.5)=520-97.50=422.50$ ✓. Both plans have the same amount ($422.50) after 6.5 weeks.

26. A — Factor: $x^2-8x+12=(x-6)(x-2)$. Zeros: $x=6$ and $x=2$ — the bakery breaks even (profit=0) when 200 or 600 items are sold. Axis of symmetry: $x=4$; vertex: $f(4)=16-32+12=-4$. Vertex $(4,-4)$ represents the minimum profit of −$400 (a loss) at 400 items. Y-intercept: $(0,12)$ represents a profit of $1,200 when 0 items are sold — which is not realistic in context; this is the mathematical y-intercept only.

27. C — Ratios: $10/5=2$, $20/10=2$, $40/20=2$ — constant ratio confirms exponential: $f(t)=5(2)^t$. At $t=6$: $f(6)=5(64)=320$ million users. For 1 billion (1000 million): $5(2)^t=1000 \rightarrow 2^t=200 \rightarrow t=\ln(200)/\ln(2)\approx7.64$. The platform first surpasses 1 billion users during year 8 ($t\approx7.64$ rounds up to the first complete year).

28. B — $a=3$, $b=-1$, $c=-10$. Discriminant$=1+120=121$. $x=(1\pm11)/6$. Solutions: $x=12/6=2$ and $x=-10/6=-5/3$. Verify $x=2$: $3(4)-2-10=12-12=0$ ✓. Verify $x=-5/3$: $3(25/9)+5/3-10=75/9+15/9-90/9=0$ ✓.

29. A — Solve $-3\leq2x+5<13$: subtract 5 throughout: $-8\leq2x<8$; divide by 2: $-4\leq x<4$. Inequality notation: $-4\leq x<4$. Interval notation: $[-4, 4)$. Graph: closed circle at −4, open circle at 4, segment between them on a number line.

30. D — Table: Exercise/Sports=54, Exercise/No Sports=36, Exercise/Total=90; No Exercise/Sports=18, No Exercise/No Sports=72, No Exercise/Total=90; Total/Sports=72, Total/No Sports=108, Total=180. Conditional frequency among exercisers: 54/90=60%. Conditional frequency among non-exercisers: 18/90=20%. The large gap (60% vs. 20%) indicates a strong positive association — students who exercise regularly are three times more likely to participate in team sports.

31. C — Axis of symmetry: $t=-80/[2(-16)]=2.5$ seconds. Maximum height: $p(2.5)=-16(6.25)+200=-100+200=100$ feet. For height=64: $-16x^2+80x=64 \rightarrow 16x^2-80x+64=0 \rightarrow x^2-5x+4=0 \rightarrow (x-4)(x-1)=0 \rightarrow x=1$ and $x=4$ seconds. Lands when $p(x)=0$: $-16x^2+80x=0 \rightarrow -16x(x-5)=0 \rightarrow x=0$ (launch) or $x=5$ seconds. Contextually valid: $t=5$ seconds.

32. B — Rewrite Line 1: $-4y=-3x+12 \rightarrow y=(3/4)x-3$; slope=3/4. Rewrite Line 2: $3y=-4x+9 \rightarrow y=(-4/3)x+3$; slope=−4/3. Product of slopes: $(3/4)(-4/3)=-1$. Since the product equals −1, the lines are perpendicular. Perpendicular lines have slopes that are negative reciprocals of each other.

33. D — Let w=width; l=3w+10. Area: $w(3w+10)=400 \rightarrow 3w^2+10w-400=0$. Quadratic formula: $w=(-10\pm\sqrt{(100+4800)})/6=(-10\pm\sqrt{4900})/6=(-10\pm70)/6$. Positive root: w=60/6=10 feet. Length=3(10)+10=40 feet. Dimensions: 40 ft × 10 ft. With 3-foot border all around: outer dimensions=(40+6)×(10+6)=46×16=736 sq ft. Inner area=400 sq ft. Border area=736−400=336 sq ft.

34. A — Table: t=0: F=2000, G=2000; t=2: F=2300, $G=2000(1.06)^2\approx\$2,247$; t=5: F=2750, $G=2000(1.06)^5\approx\$2,676$; t=10: F=3500, $G=2000(1.06)^{10}\approx\$3,582$; t=15: F=4250, $G=2000(1.06)^{15}\approx\$4,793$. G first exceeds F between t=10 and t=15 — by checking t=11: G≈3,797 and F=3,650; G>F at approximately t=11. At t=20: $G=2000(1.06)^{20}\approx\$6,414$ and F=2000+150(20)=$5,000. G exceeds F by approximately $1,414. Compound interest always eventually overtakes simple interest because exponential growth multiplies by a factor each period, while linear growth adds a constant — the exponential's rate of change itself grows, while the linear rate stays fixed.

35. C — At t=0: D(0)=42000 ($42,000 debt); S(0)=1500 ($1,500 savings); E(0)=32000 ($32,000 annual salary). Table: t=0: D=42000, S=1500, E=32000; t=2: D=35000, $S=1500(1.07)^2\approx\$1,715$, E=200(4)+3600+32000=$36,400; t=5: D=24500, $S=1500(1.07)^5\approx\$2,103$, E=200(25)+9000+32000=$46,000; t=8: D=14000, $S=1500(1.07)^8\approx\$2,574$, E=200(64)+14400+32000=$59,200; t=10: D=7000, $S=1500(1.07)^{10}\approx\$2,951$, E=200(100)+18000+32000=$68,000. Debt reaches zero: −3500t+42000=0 → t=12 years. Savings exceed $10,000: 1500(1.07)^t=10000 → (1.07)^t=6.667 → t=ln(6.667)/ln(1.07)≈28.6 years — the savings model does not reach $10,000 within 10 years. At t=10: D=$7,000 remaining; S≈$2,951; E=$68,000/year salary. The quadratic model E(t) grows fastest over 10 years — from $32,000 to $68,000 (a $36,000 increase) — because its growth rate accelerates with t. The linear debt model decreases at a steady rate, and the exponential savings model grows slowly from its small initial value.