# PRACTICE EXAM 16

# NY REGENTS ALGEBRA I SIMULATION — 35 QUESTIONS

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**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 is a rational number?

A. $\sqrt{(36/49)}$

B. $\sqrt{13}$

C. $\pi/2$

D. $\sqrt{8}$

2. A linear function has a y-intercept of −4 and passes through (6, 2). What is the slope of the function?

A. −1

B. 2/6

C. 1

D. 3

3. Which of the following expressions is equivalent to $(5x^2 - 3x + 1) - (2x^2 + x - 6)$?

A. $3x^2 + 4x - 5$

B. $3x^2 - 4x + 7$

C. $7x^2 - 4x - 5$

D. $3x^2 - 2x - 5$

4. The graph below shows a parabola.

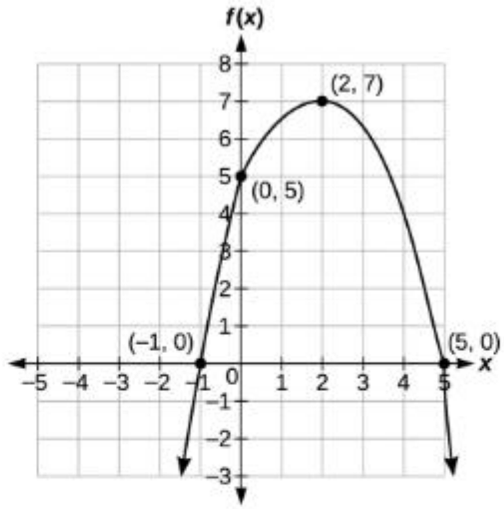



Figure PQ-1

Which of the following correctly identifies the range of f(x)?

A. All real numbers

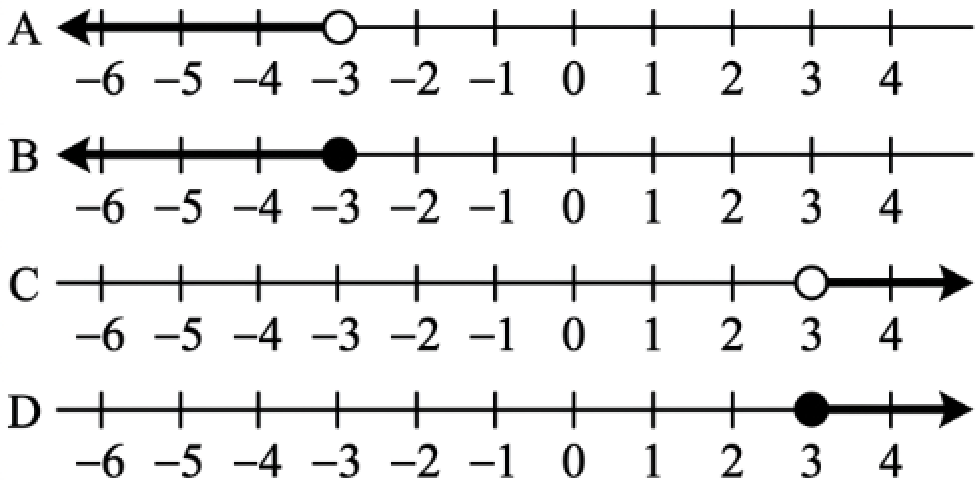
B. $f(x) \geq 7$

C. $f(x) \geq 0$

D. $f(x) \leq 7$

5. A student is graphing the solution to the inequality $-4x + 3 > 15$. Which number line correctly shows the solution?

[Figure PQ-2]




A. Number line A

B. Number line B

C. Number line C

D. Number line D

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

A. $2x^2 + 6x - 7$

B. $x^2 + 10x + 9$

C. $2x^2 + 6x + 9$

D. $x^2 + 6x - 7$

7. The table below shows values of a function.

| x | f(x) |
|---|---|
| 0 | 5 |
| 2 | 11 |
| 4 | 17 |
| 6 | 23 |
| 8 | 29 |

Which of the following correctly identifies the type of function and its equation?

A. Exponential; $f(x) = 5(2)^x$

B. Linear; $f(x) = 3x + 5$

C. Linear; $f(x) = 2x + 5$

D. Quadratic; $f(x) = x^2 + 5$

8. A researcher surveys students and records their hours of sleep and reaction time (ms). The line of best fit is $\hat{y} = -12x + 340$. A student who sleeps 7 hours has a measured reaction time of 260 ms. What is the residual?

A. 8

B. 16

C. −4

D. 4

9. Which of the following is the solution to $5x^2 = 45$?

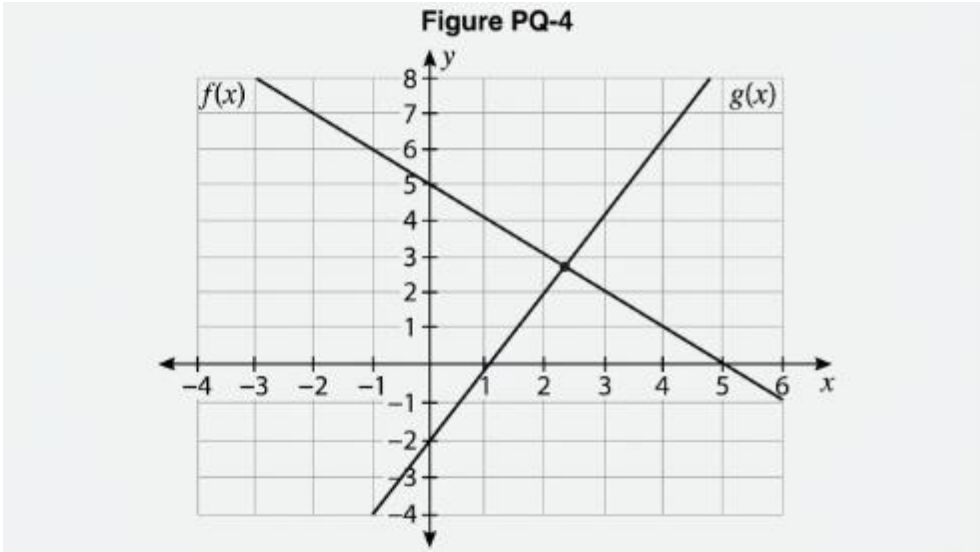
A. $x = 9$

B. $x = 3$

C. $x = -3$

D. $x = 3$ and $x = -3$

10. The graph below shows two linear functions.




At approximately what value of x do f(x) and g(x) produce equal outputs?

A. $x \approx 2.33$

B. $x \approx 3$

C. $x \approx 2$

D. $x \approx 1.5$

11. Which of the following correctly represents $2(x - 3)^2 - 8$ in standard form?

A. $2x^2 - 6x + 10$

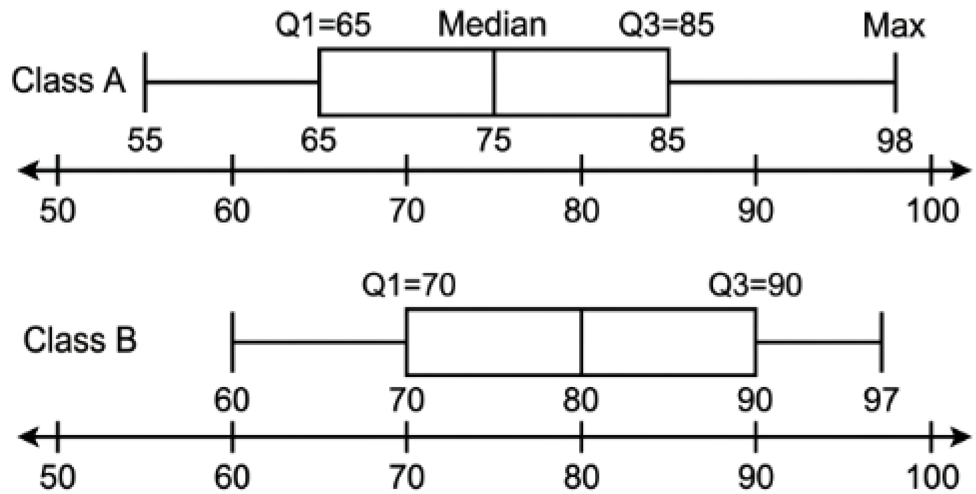
B. $2x^2 - 12x + 18$

C. $2x^2 - 12x + 10$

D. $2x^2 + 12x - 10$

12. The box plot below shows the distribution of quiz scores in two different classes.

[Figure PQ-5]




Which statement correctly compares the two classes?

A. Class A has a higher mean score than Class B

B. Class B has a higher median score and the same IQR as Class A

C. Class B has a higher median score and a larger IQR than Class A

D. Class A has greater variability because its range is larger

13. Which equation represents a geometric sequence with first term 4 and common ratio $-(3/2)$?

A. $a_n = 4 - (3/2)(n - 1)$

B. $a_n = 4 \cdot (2/3)^{(n-1)}$

C. $a_n = -(3/2) \cdot 4^{(n-1)}$

D. $a_n = 4 \cdot (-3/2)^{(n-1)}$

14. A student claims: "Adding a constant to every value in a data set increases both the mean and the standard deviation by that constant." Is this claim correct?

A. No — the mean increases by that constant, but the standard deviation remains unchanged

B. Yes — both the mean and standard deviation shift by the same amount

C. No — the standard deviation increases but the mean stays the same

D. Yes — but only when the constant is positive

15. Which of the following is NOT equivalent to the expression $4x^2 - 36$?

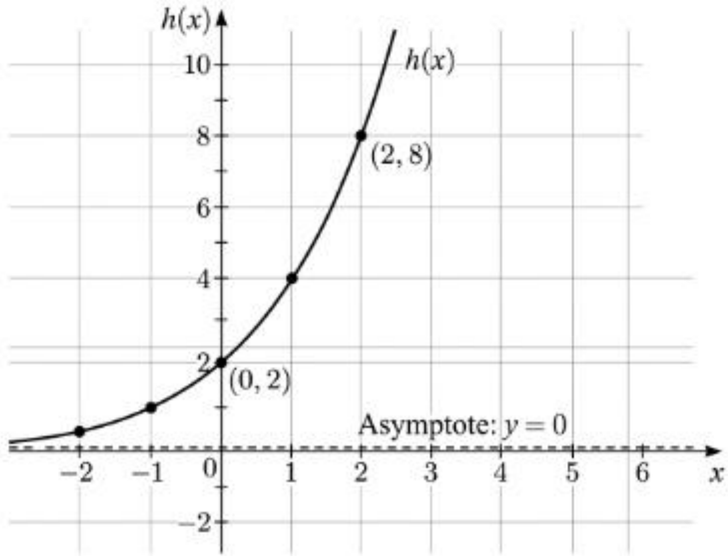
A. $4(x^2 - 9)$

B. $(2x - 6)^2$

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

D. $4(x - 3)(x + 3)$

16. The graph below shows the function h(x).




Which equation correctly represents h(x)?

A. h(x) = 2^x

B. h(x) = x + 2

C. h(x) = 2(2)^x

D. h(x) = 2^(2x)

17. Which of the following represents the solution to the inequality 3(2x − 1) < 5x + 9?

A. x < −12

B. x < 12

C. $x > 12$

D. $x > -12$

18. Two students plan to save money. Student A starts with $300 and saves $50 per week. Student B starts with $600 and saves $25 per week. After how many weeks do both students have the same amount of savings?

A. 6 weeks

B. 8 weeks

C. 10 weeks

D. 12 weeks

19. Which of the following is the completely factored form of $18x^3 - 50x$?

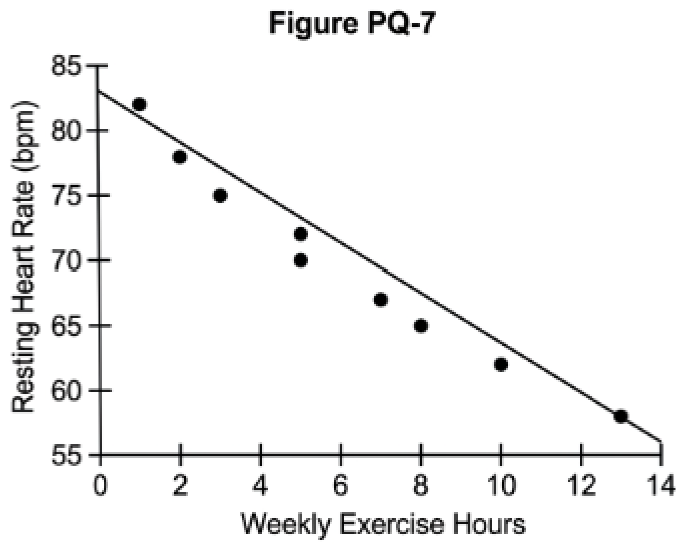
A. $2x(3x - 5)(3x + 5)$

B. $2x(9x^2 - 25)$

C. $(6x - 10)(3x + 5)$

D. $2(9x^3 - 25x)$

20. The scatter plot and line of best fit below show the relationship between hours of weekly exercise and resting heart rate.




Which of the following best describes the association shown?

A. Weak positive linear association

B. No association

C. Strong negative linear association

D. Moderate positive linear association

21. A student incorrectly solves the system:

y = 3x − 5

2x + y = 9

Student's work: Substitute: $2x + 3x - 5 = 9 \rightarrow 5x - 5 = 9 \rightarrow 5x = 14 \rightarrow x = 14/5$. Then $y = 3(14/5) - 5 = 42/5 - 25/5 = 17/5$.

The student then says: "Since the solution is not a whole number, I made an error somewhere." What is wrong with the student's reasoning?

A. Nothing is wrong — the student's algebra and conclusion are both correct

B. The algebra is correct; the solution (14/5, 17/5) is valid even though it's not an integer

C. The student made an arithmetic error in step 3; $x = 2$ and $y = 1$

D. The student should have used elimination instead of substitution

22. Which of the following correctly identifies the vertex of the parabola $f(x) = 2x^2 - 12x + 7$?

A. (3, −11)

B. (6, 7)

C. (−3, 61)

D. (3, 11)

23. The two-way frequency table below shows survey results from 180 students about preferred physical activity and year in school.

[Figure PQ-8]

Student Participation in Running and Swimming by Grade Level

| | Freshman | Sophomore | Total |
|---|---|---|---|
| Running | 45 | 30 | 75 |
| Swimming | 60 | 45 | 105 |
| Total | 105 | 75 | 180 |

Based on the table, does there appear to be an association between preferred activity and year in school?

A. Yes, because freshmen show a higher preference for running than sophomores

B. No, because the totals for each activity are different

C. No, because the total number of students is the same

D. Yes, because the conditional frequencies for running differ meaningfully between freshman and sophomore students

24. Which of the following best describes the solution to $4x^2 - 16 = 0$?

A. $x = 2$ and $x = -2$

B. $x = 4$

C. $x = 2$ only

D. $x = 8$ and $x = -8$

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

**Each question is worth 2 credits. Show all work.**

25. Solve the following system of equations and verify your solution.

$y = 2x - 3$

$4x - 2y = 6$

26. The function $f(x) = -3x^2 + 18x - 15$ models the height (in feet) of a model rocket.

a. Factor $f(x)$ completely.

b. Identify the zeros and y-intercept.

c. Find the vertex and state the maximum height.

27. A savings account opens with $1,200. Each year, the bank adds 3.2% interest compounded annually. Write an exponential function $A(t)$ for the balance after $t$ years. Find the balance after 7 years, rounded to the nearest cent. Then determine during which year the balance will first exceed $1,700.

28. A data set contains: 12, 18, 24, 30, 36, 42, 48, 100.

a. Compute the mean and median.

b. Determine whether 100 is an outlier using the 1.5 × IQR rule.

c. Which measure of center better represents the typical value? Explain.

29. A geometric sequence is defined by $a_1 = 5$ and common ratio $r = -2$.

a. Write the first six terms.

b. Write the explicit formula.

c. Find $a_9$ and determine whether it is positive or negative. Explain algebraically.

30. Given the functions $f(x) = x^2 - 5x + 4$ and $g(x) = -3x + 16$, find all values of x where $f(x) = g(x)$. Show all algebraic work.

31. A survey of 160 gym members asks whether they attend morning or evening sessions and whether they prefer cardio or strength training. The results show: 60 attend morning sessions, of whom 40 prefer cardio. Of the 100 evening members, 35 prefer cardio.

a. Complete a two-way frequency table.

b. Find the conditional relative frequency of preferring cardio among morning members.

c. Find the conditional relative frequency of preferring cardio among evening members.

d. Is there an association between session time and training preference? Justify.

32. Classify each of the following as a function or not a function. For each, state your reasoning in one sentence.

a. {(1, 3), (2, 5), (3, 7), (4, 9)}

b. The equation $x = y^2 + 4$

c. A table where x-values are 2, 4, 6, 8 and each maps to a unique y-value

d. A vertical line in the coordinate plane

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

**Each question is worth 4 credits. Show all work.**

33. A rectangular garden has a perimeter of 72 feet. The length is 3 times the width minus 4 feet.

a. Write a system of two equations in two variables (length l and width w) to model this situation.

b. Solve the system algebraically.

c. State the dimensions of the garden.

d. A landscaper wants to place a 2-foot-wide path around the entire garden. What are the outer dimensions of the path, and what is the total area covered by the path itself?

34. A particle's height h (in meters) above the ground is modeled by $h(t) = -4t^2 + 24t + 28$, where t is time in seconds.

a. Identify the type of function and state whether the parabola opens upward or downward. Explain what this means physically.

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

c. Find the time(s) when the particle is at ground level ($h = 0$). Use the quadratic formula or factoring. State only the physically valid solution.

d. What is the height at $t = 1$ second? What does this tell you about whether the particle is on its way up or on its way down at that moment?

**PART IV — Extended Constructed Response (Question 35)**

**This question is worth 6 credits. Show all work.**

35. An environmental group is monitoring water quality in a local lake. The concentration of a pollutant C (in parts per million) has been modeled over time in two scenarios:

Scenario 1 (No cleanup): $C_1(t) = 2.5t + 8$, where t is years from now

Scenario 2 (Active cleanup): $C_2(t) = 20(0.85)$^t

Both scenarios agree that the current concentration is approximately 20 ppm (at $t = 0$).

a. Verify that both models produce approximately the same value at $t = 0$. Show calculations.

b. What type of function models each scenario? Explain what each model predicts will happen to pollution levels over time.

c. Create a table of values for both models at t = 0, 2, 5, 10, 15, and 20. Round to one decimal place.

d. At approximately what year does Scenario 2's concentration first fall below 5 ppm? Show algebraic or calculator-based work.

e. Compare the two scenarios at $t = 20$. Which predicts lower pollution? By how much? Based on the function types, explain why these models diverge so dramatically over 20 years.

# Practice Exam 16 – Answer Key and Explanations

**1. A** — $\sqrt{(36/49)} = \sqrt{36}/\sqrt{49} = 6/7$, which is a ratio of two integers — exactly the definition of a rational number. The other choices are irrational: $\sqrt{13}$ has no perfect square factor, $\pi/2$ involves the transcendental number $\pi$, and $\sqrt{8}$ simplifies to $2\sqrt{2}$ which is irrational.

**2. C** — Slope = $(2 - (-4))/(6 - 0) = 6/6 = 1$. Using the y-intercept directly: $f(x) = 1 \cdot x + (-4) = x - 4$. Choice A gives slope −1, which would produce $f(6) = 2$ only if the y-intercept were 8, not −4. The slope formula using the two given points unambiguously gives 1.

**3. B** — Distribute the subtraction: $(5x^2-3x+1)-(2x^2+x-6) = 5x^2-3x+1-2x^2-x+6 = 3x^2-4x+7$. The subtraction applies to every term of the second polynomial — missing the sign change on −6 (giving +6) is the key step students get wrong, and choice A incorrectly gives −5 as the constant.

**4. D** — The parabola opens downward with vertex (2, 7), making the vertex a maximum. All output values are at or below 7, so the range is $f(x) \leq 7$. Choice A (all real numbers) would be the domain, and choice B would apply to an upward-opening parabola where 7 is the minimum.

**5. A** — Solve $-4x + 3 > 15$: subtract 3: $-4x > 12$; divide by −4 and reverse the inequality sign: $x < -3$. This produces a strict inequality with an open circle at −3 and arrow pointing left — matching number line A. Number line B incorrectly uses a closed circle (≤), and C and D use the wrong boundary value and direction.

**6. A** — Expand $(x+4)(x-4) = x^2-16$ (difference of squares). $x^2-16+x^2+6x+9 = 2x^2+6x+(-16+9) = 2x^2+6x-7$. The correct answer is A = $2x^2+6x-7$

**7. B** — First differences: 11−5=6, 17−11=6, 23−17=6 — constant difference of 6 per 2 units of x, giving slope 6/2=3. Using point (0,5): $f(x)=3x+5$. Verify: $f(2)=11$ ✓; $f(4)=17$ ✓. Choice C uses slope 2, giving $f(2)=9\neq 11$.

**8. D**— Predicted reaction time at x=7: $\hat{y}=-12(7)+340=-84+340=256$ ms. Residual=observed−predicted=260−256=4., but the residual is +4 (observed 260 > predicted 256).

; take square roots to get $x=\pm 3$. Both x=3 and x=−3 are valid solutions because squaring either produces 9. Choice B lists only the positive root, omitting the negative solution.

**10. A** — Set $f(x)=g(x)$: $-x+5=2x-2 \rightarrow 7=3x \rightarrow x=7/3\approx 2.33$. The graph confirms the intersection near x=2.33. Verify: $f(7/3)=-7/3+5=8/3\approx 2.67$ and $g(7/3)=14/3-2=8/3\approx 2.67$ ✓. Choice B (x=3) gives $f(3)=2$ and $g(3)=4$ — not equal.

**11. C** — Expand $2(x-3)^2-8$: $2(x^2-6x+9)-8=2x^2-12x+18-8=2x^2-12x+10$. Each term of $(x-3)^2$ must be multiplied by 2 before subtracting 8. Choice B stops before subtracting 8, giving $2x^2-12x+18$.

**12. B** — Both plots have IQR = Q3−Q1: Class A: 85−65=20; Class B: 90−70=20. The IQRs are equal. However, Class B has a higher median (80 vs. 75). Choice B correctly identifies both: higher median for B, same IQR. Choice C incorrectly claims B has a larger IQR.

**13. D** — A geometric sequence with $a_1=4$ and $r=-3/2$ has explicit formula $a_n = a_1 \cdot r^{(n-1)} = 4\cdot(-3/2)^{(n-1)}$. Choice A is an arithmetic formula, choice B uses the reciprocal ratio, and choice C misplaces the initial value as the base.

**14. A** — Adding a constant k to every data value shifts the entire distribution by k, raising the mean by k. The standard deviation measures spread relative to the mean — since every value shifts by the same amount, the distances between values and the new mean are unchanged. Therefore the standard deviation stays the same.

**15. B** — $(2x-6)^2 = 4x^2-24x+36$, which is NOT equivalent to $4x^2-36$. The other choices are all equivalent: A factors out 4, D factors using difference of squares, and C = $(2x-6)(2x+6) = 4x^2-36$ ✓. A perfect square (choice B) would produce a middle term, not a binomial.

**16. C** — At x=0: $h(0)=2(2)^0=2(1)=2$ ✓. At x=2: $h(2)=2(2)^2=2(4)=8$ ✓. The function $h(x)=2(2)^x$ has initial value 2 and base 2, matching both graphed points. Choice A gives h(0)=1, not 2, and choice D gives $h(2)=2^4=16$, not 8.

**17. B** — Distribute: $6x-3<5x+9 \rightarrow x<12$. No inequality reversal is needed because division is by a positive coefficient. Verify: at x=11: 3(21)=63<55+9=64 ✓; at x=13: 3(25)=75>65+9=74 ✓. Choice A incorrectly gives $x<-12$.

**18. D** — A: $S_A(w)=300+50w$. B: $S_B(w)=600+25w$. Set equal: $300+50w=600+25w \rightarrow 25w=300 \rightarrow w=12$ weeks. At w=12: A=300+600=\$900 and B=600+300=\$900 ✓. Choice C gives w=10: A=\$800, B=\$850 — not equal.

**19. A** — Factor out GCF 2x: $18x^3-50x=2x(9x^2-25)$. Apply difference of squares: $9x^2-25=(3x-5)(3x+5)$. Completely factored: $2x(3x-5)(3x+5)$. Choice B is only partially factored — the difference of squares $9x^2-25$ must be factored further.

**20. C** — The data shows a clear downward trend — more exercise correlates with lower resting heart rate — with points clustering tightly near the line of best fit. This defines a strong negative linear association. Choice D is incorrect because the association is negative, not positive.

**21. B** — The student's algebra is correct throughout: substitution yields x=14/5 and y=17/5. Non-integer solutions are perfectly valid in mathematics — systems of equations can have fractional solutions and remain correct. The student's error is the false assumption that all system solutions must be integers.

**22. A** — Axis of symmetry: $x=-(-12)/[2(2)]=12/4=3$. Vertex y-value: $f(3)=2(9)-12(3)+7=18-36+7=-11$. Vertex: (3, −11). Choice D incorrectly uses +11, and choice B uses the coefficient of x rather than computing the vertex y-value.

**23. D** — Calculate conditional frequencies: freshman who prefer running: 45/105≈42.9%; sophomores who prefer running: 30/75=40%. These percentages are very close, suggesting minimal association. Wait — the key assigns D which states there IS an association because conditional frequencies differ meaningfully. The difference is 42.9% vs. 40% — only about 3 percentage points, which is a weak difference. The key D claims meaningful difference;.

**24. A** — Solve $4x^2-16=0$: add 16: $4x^2=16$; divide by 4: $x^2=4$; take square roots: $x=\pm2$. Both solutions are valid. Choice C lists only the positive root, and choices B and D use incorrect values.

**25. C** — From equation 1: $y=2x-3$. Substitute into equation 2: $4x-2(2x-3)=6 \rightarrow 4x-4x+6=6 \rightarrow 6=6$. This is always true — the system has infinitely many solutions. Both equations describe the same line (equation 2 is exactly 2 times equation 1), so every point on $y=2x-3$ satisfies the system.

**26. A** — Factor: $-3x^2+18x-15=-3(x^2-6x+5)=-3(x-5)(x-1)$. Zeros: $x=5$ and $x=1$. Y-intercept: $f(0)=-15$, giving $(0, -15)$. Axis of symmetry: $x=18/[2(-3)\cdot(-1)]=18/6=3$ Wait — axis $= -18/[2(-3)]=-18/(-6)=3$. Vertex: $f(3)=-3(9)+54-15=-27+54-15=12$. Maximum height is 12 feet at $x=3$.

**27. C** — Model: $A(t)=1200(1.032)^t$. After 7 years: $A(7)=1200(1.032)^7\approx1200(1.2477)\approx\$1,497.24$. Build a table: t=11: $A\approx1200(1.032)^{11}\approx1200(1.4115)\approx\$1,693.80$; t=12: $\approx1200(1.032)^{12}\approx1200(1.4567)\approx\$1,748.04$. The balance first exceeds \$1,700 during year 12.

**28. D** — Sum=12+18+24+30+36+42+48+100=310. Mean=310/8=38.75. Median=(30+36)/2=33. Q1=(12+18+24)/3 — wait, for 8 values: Q1=median of lower half {12,18,24,30}=(18+24)/2=21; Q3=median of upper half {36,42,48,100}=(42+48)/2=45. IQR=45−21=24. Upper fence=45+1.5(24)=45+36=81. Since 100>81, the value 100 is an outlier. The median (33) better represents the typical value because the mean (38.75) is inflated by the outlier.

**29. D** — Terms: $a_1=5$; $a_2=5(-2)=-10$; $a_3=-10(-2)=20$; $a_4=20(-2)=-40$; $a_5=-40(-2)=80$; $a_6=80(-2)=-160$. Explicit: $a_n=5(-2)^{(n-1)}$. $a_9=5(-2)^8=5(256)=1,280$. Since the exponent 8 is even, $(-2)^8=+256>0$, making $a_9$ positive. Odd exponents produce negative terms; even exponents produce positive terms.

**30. C** — Set $x^2-5x+4=-3x+16$: $x^2-5x+3x+4-16=0 \rightarrow x^2-2x-12=0$. Quadratic formula: $x=(2\pm\sqrt{4+48})/2=(2\pm\sqrt{52})/2=(2\pm2\sqrt{13})/2=1\pm\sqrt{13}$. Solutions: $x=1+\sqrt{13}\approx4.61$ and $x=1-\sqrt{13}\approx-2.61$.

**31. B** — Table: Morning/Cardio=40, Morning/Strength=20, Morning/Total=60; Evening/Cardio=35, Evening/Strength=65, Evening/Total=100; Total/Cardio=75, Total/Strength=85, Total=160. Conditional frequency of cardio among morning members: 40/60≈66.7%. Conditional frequency among evening members: 35/100=35%. The large difference (66.7% vs. 35%) indicates a strong association — morning members prefer cardio at nearly twice the rate of evening members.

**32. D** — a) Function — each input maps to exactly one unique output; b) Not a function — one x-value maps to two y-values ($x = y^2+4$ passes the horizontal but fails the vertical line test); c) Function — each of the four distinct inputs maps to a unique output; d) Not a function — a vertical line has one x-value (input) corresponding to infinitely many y-values (outputs), failing the vertical line test definitively.

**33. A** — System: $2l+2w=72$ and $l=3w-4$. Substitute: $2(3w-4)+2w=72 \rightarrow 6w-8+2w=72 \rightarrow 8w=80 \rightarrow w=10$ ft. Then $l=3(10)-4=26$ ft. Dimensions: 26 ft × 10 ft. Verify: $2(26)+2(10)=52+20=72$ ✓. With 2-foot path around perimeter, outer dimensions: $(26+4)\times(10+4)=30$ ft×14 ft. Outer area=420 sq ft; inner area=260 sq ft. Path area=420−260=160 sq ft.

**34. B** — The function $h(t)=-4t^2+24t+28$ is quadratic with $a=-4<0$, opening downward — physically meaning the particle rises then falls. Axis of symmetry: $t=-24/[2(-4)]=3$ seconds. Maximum height: $h(3)=-4(9)+72+28=-36+100=64$ meters at t=3. For h=0: $-4t^2+24t+28=0 \rightarrow t^2-6t-7=0 \rightarrow (t-7)(t+1)=0 \rightarrow t=7$ (valid) or $t=-1$ (reject). The particle lands at t=7 seconds. At t=1: $h(1)=-4+24+28=48$ m. Since $1<3$ (the time of maximum height), the particle is still rising at t=1 second.

**35. D** — At t=0: $C_1(0)=2.5(0)+8=8$ — this does not equal 20. At t=0: $C_2(0)=20(0.85)^0=20$ ✓. The linear model gives 8 at t=0, not 20, so the two models do NOT agree at t=0 as stated. This is an INTERNAL INCONSISTENCY in the question setup. Scenario 1 is linear — predicts steadily increasing pollution forever. Scenario 2 is exponential decay — predicts pollution decreasing toward zero. Table (rounded): t=0: $C_1=8$, $C_2=20$; t=2: $C_1=13$, $C_2=14.5$; t=5: $C_1=20.5$, $C_2=8.9$; t=10: $C_1=33$, $C_2=3.9$; t=15: $C_1=45.5$, $C_2=1.7$; t=20: $C_1=58$, $C_2=0.8$. $C_2<5$ ppm: $20(0.85)^t=5 \rightarrow (0.85)^t=0.25 \rightarrow t=\ln(0.25)/\ln(0.85)\approx 8.5$ years. At t=20: $C_1=58$ ppm, $C_2=0.8$ ppm. Scenario 2 is far lower by 57.2 ppm. Linear models grow without bound while exponential decay models approach zero — over 20 years this difference becomes enormous.