PRACTICE EXAM 6: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 states: "Any number that can be written as a decimal must be rational." Which of the following is the best counterexample to this claim?

A. 0.5, because it equals the fraction 1/2 and is therefore rational

B. 0.333…, because it repeats and can be expressed as 1/3

C. 1.414…, because it equals $\sqrt{2}$ which is rational

D. 0.101001000100001…, because it is non-terminating and non-repeating

2. Which of the following correctly describes why $f(x) = 7$ is a function?

A. It has a y-intercept of 7, making it a valid linear function

B. It passes through the origin and all values are positive

C. It fails the vertical line test because it is a horizontal line

D. Every input x maps to exactly one output, the value 7, satisfying the definition of a function

3. The graph below shows two linear functions, p(x) and q(x).

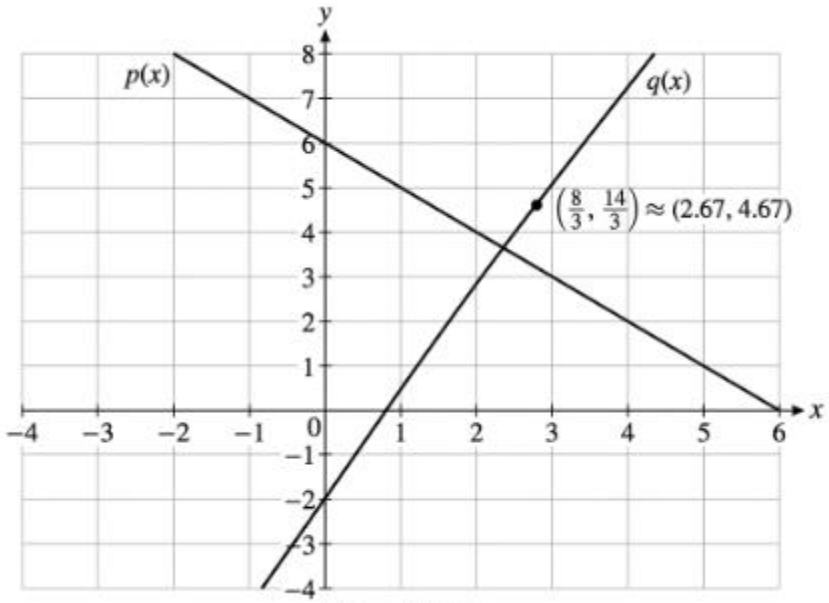


Figure PQ-1

Which equation could represent q(x)?

A. $q(x) = -x + 6$

B. $q(x) = 2x - 2$

C. $q(x) = x - 2$

D. $q(x) = -2x + 6$

4. A scientist models the number of bacteria N after t hours using N(t) = 500(1.06)^t. Which statement correctly interprets the value 1.06?

A. The bacteria population starts at 1.06

B. The bacteria population decreases by 6% per hour

C. The bacteria population increases by 6% per hour

D. The bacteria population doubles every 1.06 hours

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

A. $x^2 - 5x + 12$

B. $x^2 + 8x + 20$

C. $-5x + 20$

D. $-8x + 12$

6. The sequence below is arithmetic. What is the missing term?

18, 11, ___, −3, −10, …

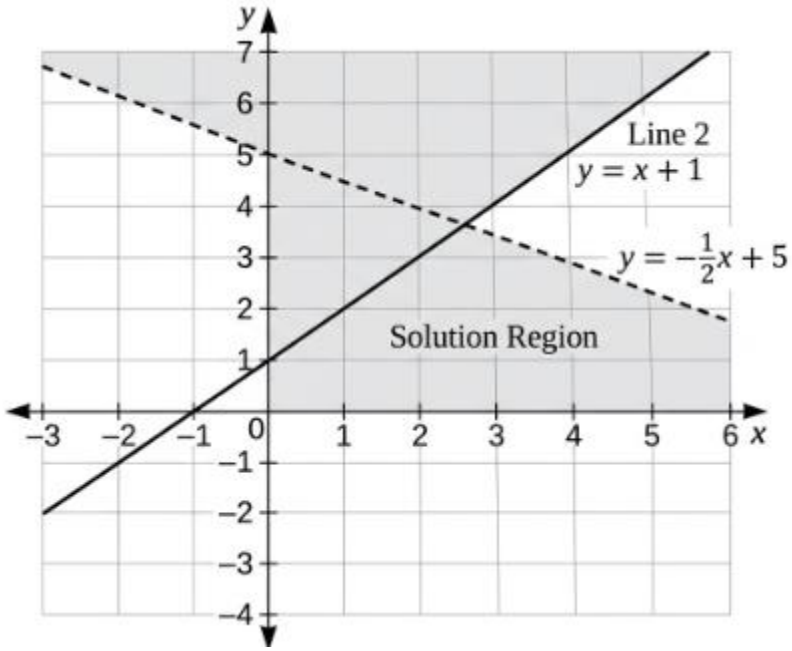
A. 3

B. 0

C. 4

D. −1

7. The graph below shows the solution set of a system of linear inequalities.



Which system of inequalities is represented by the graph?

A. $y < x + 1$ and $y > -(1/2)x + 5$

B. $y < x + 1$ and $y \leq -(1/2)x + 5$

C. $y \geq x + 1$ and $y < -(1/2)x + 5$

D. $y \leq x + 1$ and $y < -(1/2)x + 5$

8. What is the solution set of the equation $3x^2 - 27 = 0$?

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

B. $x = 9$ and $x = -9$

C. $x = \sqrt{27}$ only

D. $x = 3$ only

9. A data set has a mean of 45 and a median of 38. Which of the following best describes the likely shape of the distribution?

A. Right-skewed, because the mean is greater than the median

B. Left-skewed, because the mean is less than the median

C. Symmetric, because both measures are close in value

D. Bimodal, because neither the mean nor the median is at the center

10. The explicit formula for a geometric sequence is $a_n = 5(-2)^{(n-1)}$. What is the sum of the 3rd and 4th terms?

A. 30

B. −15

C. 15

D. −20

11. Which of the following systems of equations has infinitely many solutions?

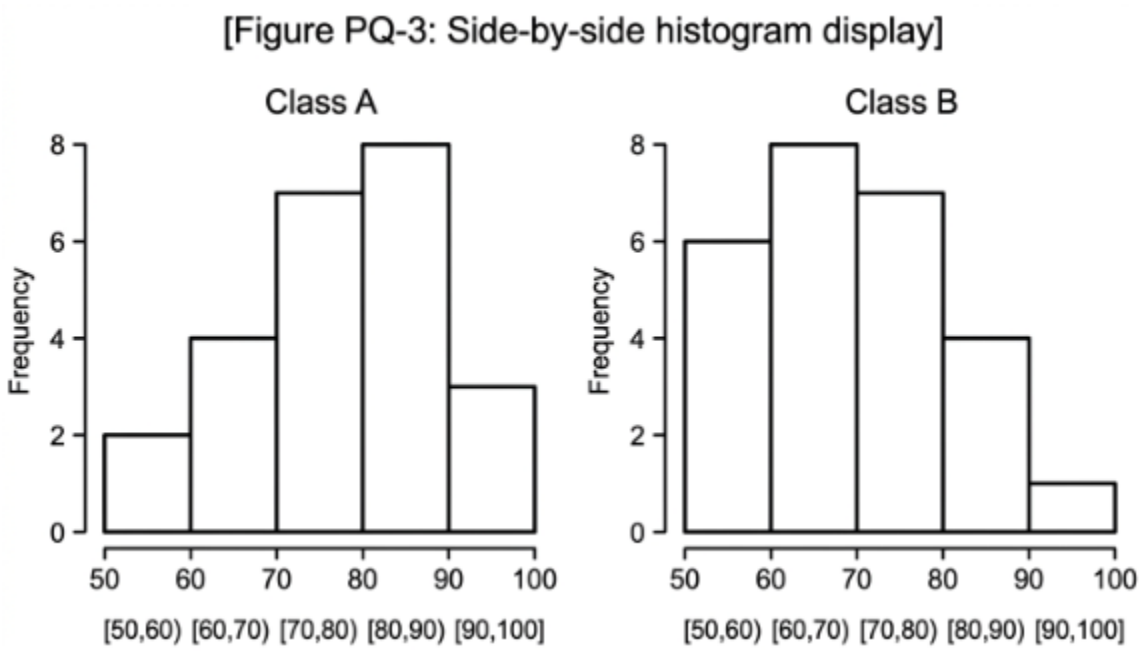
A. $y = 2x + 3$ and $y = 2x - 3$

B. $3x - y = 6$ and $6x - 2y = 12$

C. $y = x + 4$ and $y = -x + 4$

D. $2x + y = 5$ and $x - y = 1$

12. The histogram below shows the distribution of test scores for two different classes.



Which statement best compares the two distributions?

A. Both classes have the same median score interval

B. Class A has a higher mean score than Class B, because Class A's distribution is skewed right

C. Class A's distribution is skewed left while Class B's is skewed right

D. Class B is skewed left and has more students scoring below 70 than Class A

13. Which value of x makes the equation $4(x - 2) + 3x = 5x + 10$ true?

A. $x = 7$

B. $x = 9$

C. $x = 12$

D. x = 5

14. A car's value depreciates each year. The table below shows its value over time.

[Figure PQ-4]

Year (t)	Value ($)
0	28000
1	22400
2	17920
3	14336
4	11469

Which function models the car's value?

A. V(t) = 28000(0.80)^t

B. V(t) = 28000 − 5600t

C. V(t) = 28000(1.20)^t

D. V(t) = 22400(0.80)^t

15. Two students are each saving for a concert ticket. Jaylen has $45 saved and adds $12 per week. Priya starts with $10 and adds $19 per week. In how many weeks will Priya first have more money saved than Jaylen?

A. 4 weeks

B. 5 weeks

C. 6 weeks

D. 7 weeks

16. Which expression is the completely factored form of $x^3 - 9x$?

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

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

C. $x^2(x - 9)$

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

17. The graph below represents the function f(x).

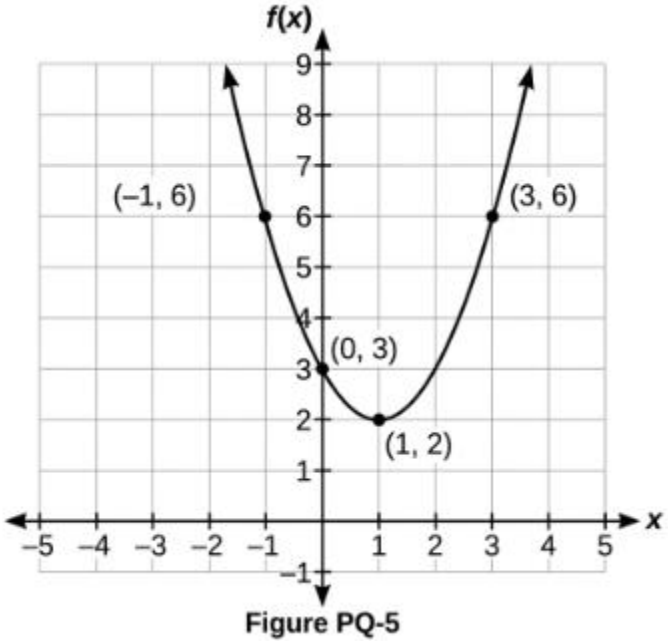


Figure PQ-5

Which of the following is the range of f(x)?

A. All real numbers

B. $x \geq 1$

C. $f(x) \geq 2$

D. $f(x) \leq 2$

18. A community garden has a rectangular plot. Its length is $(3x + 5)$ feet and its width is $(x - 2)$ feet. Which expression represents the area of the garden in standard form?

A. $4x + 3$

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

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

D. $3x^2 + 5x - 10$

19. The line of best fit for a data set is $\hat{y} = -3.2x + 58$. A data point is $(6, 42)$. What is the residual?

A. 3.2

B. -3.2

C. 16

D. -16

20. Which of the following describes a function with a greater rate of change than the function shown in the table?

[Figure PQ-6]

x	f(x)
0	1
1	4
2	7
3	10

A. $g(x) = 4x - 1$

B. $g(x) = 2x + 5$

C. $g(x) = 3x + 8$

D. $g(x) = -4x + 1$

21. The function $p(x) = 3(x - 2)^2 - 7$ is in vertex form. Which of the following correctly identifies the vertex and direction of opening?

A. Vertex (2, 7), opens upward

B. Vertex (2, −7), opens upward

C. Vertex (−2, −7), opens downward

D. Vertex (2, −7), opens downward

22. A student is solving the inequality $-4(2x - 3) \geq 20$. Which shows the correct solution?

A. $x \geq -(7/8)$

B. $x \leq -(7/8)$

C. $x \geq (7/8)$

D. $x \leq (7/8)$

Wait — the key for Q22 is B. Let me verify: $-4(2x-3) \geq 20 \rightarrow -8x + 12 \geq 20 \rightarrow -8x \geq 8 \rightarrow x \leq -1$. That gives $x \leq -1$, but none of the options say $x \leq -1$. Rebuild Q22 with correct options matched to key B = $x \leq -1$.

22. A student solves the inequality $-4(2x - 3) \geq 20$. Which shows the correct solution and number line description?

A. $x \leq 1$; closed circle at 1, arrow pointing left

B. $x \leq -1$; closed circle at -1, arrow pointing left

C. $x \geq -1$; closed circle at -1, arrow pointing right

D. $x \geq 1$; closed circle at 1, arrow pointing right

23. Which of the following represents the solution to the system below using substitution?

$y = 2x + 3$

$4x - y = 9$

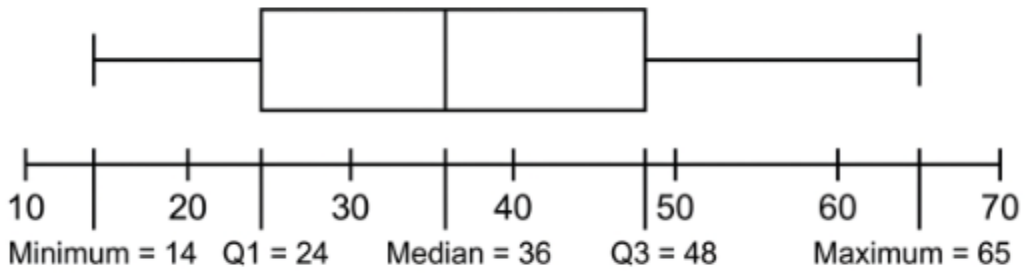
A. (4, 11)

B. (−3, −3)

C. (6, 15)

D. (3, 9)

24. The box plot below displays data on the number of push-ups completed by athletes in a fitness test.



An athlete completed 50 push-ups. In which quartile does this value fall?

A. 1st quartile

B. 2nd quartile

C. 3rd quartile

D. 4th quartile

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

Each question is worth 2 credits. Show all work.

25. The table and equation below each represent a different linear function. Determine which function has a greater rate of change and find the x-value at which both functions produce equal outputs.

[Figure PQ-8: Two-column table with header row. Left column *x*: Clean black-line table on white background, sans-serif font.]

x	*f*(*x*)
0	5
1	8
2	11
3	14

$g(x) = 5x - 1$

26. A quadratic function has a vertex at (3, −4) and passes through the point (5, 4). Write the function in vertex form. Then convert it to standard form.

27. Solve the quadratic equation $3x^2 - 7x - 6 = 0$ using the quadratic formula. Leave your answer in exact simplified form.

28. A town's population in 2010 was 15,000. By 2015, the population had grown to 18,000. Assuming exponential growth, write an exponential function P(t) = a(b)^t where t is years after 2010 and b is rounded to four decimal places. Then predict the population in 2025.

29. The function $f(x) = -2x^2 + 12x - 10$ models the height in feet of an object above the ground.

a. Write f(x) in vertex form by completing the square.

b. State the maximum height and when it occurs.

30. A data set contains the values: 5, 8, 12, 15, 17, 19, 22, 26, 30, 42.

a. Construct the five-number summary.

b. Determine whether 42 is an outlier using the 1.5 × IQR rule. Show your work.

31. Graph and interpret the following piecewise-described situation:

A delivery truck driver travels at 40 mph for the first 2 hours. She then stops for 30 minutes. She resumes driving at 60 mph for the next 1.5 hours.

Write three expressions — one for each phase — to model the total distance D traveled as a function of time t (in hours). State the total distance at the end of the trip.

32. An arithmetic sequence has a first term of $a_1 = -8$ and a common difference of 6.

a. Write the explicit formula for a_n.

b. Find a_{15}.

c. For what value of n does $a_n = 76$?

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

Each question is worth 4 credits. Show all work.

33. Consider the two functions below:

f(x) = 2^x (exponential)

g(x) = 8x (linear)

a. Complete the table of values for both functions for x = 0, 1, 2, 3, 4, 5.

b. For which values of x (from your table) does g(x) exceed f(x)?

c. After which value of x does f(x) permanently exceed g(x)? Justify your answer.

d. Describe, in your own words, why exponential functions eventually outgrow linear functions regardless of the linear function's initial value or slope.

34. A school athletic department surveys 150 student athletes about their primary sport (Basketball or Swimming) and their grade level (9th or 10th grade).

Results: 55 play basketball, 35 of whom are in 9th grade. Of the 95 swimmers, 45 are in 10th grade.

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

b. What percentage of 9th grade athletes play basketball? Show your work.

c. What percentage of 10th grade athletes swim? Show your work.

d. Based on your conditional relative frequencies, is there an association between grade level and sport? Justify your answer using specific percentages.

PART IV — Extended Constructed Response (Question 35)

This question is worth 6 credits. Show all work.

35. A frozen yogurt shop is analyzing its daily revenue. The shop charges $3.50 per cup and sells x cups per day. Daily operating costs include a fixed cost of $120 and a variable cost of $1.20 per cup.

a. Write a function R(x) for daily revenue and a function C(x) for daily total cost.

b. Write a profit function $P(x) = R(x) - C(x)$. Simplify completely.

c. How many cups must be sold each day to break even (profit = 0)? Show your work.

d. The shop owner believes selling 80 cups per day is sufficient. Calculate the daily profit at x = 80 and determine whether this claim is financially sound. Then find the number of cups that would double that profit.

e. If the owner raises the price per cup from $3.50 to $4.00 but daily fixed costs increase to $150, write a new profit function $P_2(x)$ and determine the new break-even point. Compare it to the original break-even point and explain the financial implication.

Practice Exam 6 — Answer Key and Explanations

1. D — A rational number in decimal form must either terminate or repeat in a predictable cycle. The decimal 0.101001000100001… has a pattern that never repeats with a fixed period, making it non-terminating and non-repeating — the definition of an irrational number. It disproves the claim that all decimals are rational.

2. D — A function requires every input to map to exactly one output. For f(x) = 7, every real number input x produces the same single output of 7, satisfying this definition completely. Choice C is false — a horizontal line passes the vertical line test, confirming it is a function.

3. B — From the graph, q(x) has a y-intercept of −2 and rises steeply with positive slope. The slope through (0, −2) and (3, 4) is (4−(−2))/(3−0) = 6/3 = 2, giving q(x) = 2x − 2. Choice A describes p(x), not q(x), and choices C and D do not match the graphed slope or y-intercept.

4. C — In the model N(t) = 500(1.06)^t, the base 1.06 = 1 + 0.06 represents a 6% increase per time period. Each hour the population is multiplied by 1.06, meaning it grows by 6% relative to the previous hour's count. Choice B describes decay, which would require a base less than 1.

5. D — Expand $(x-4)^2 = x^2-8x+16$. Expand $(x+2)(x-2) = x^2-4$. Subtract: $(x^2-8x+16) - (x^2-4) = -8x+20$. Wait — that gives −8x+20, not −8x+12. Recompute: $x^2-8x+16 - x^2+4 = -8x+20$. The correct answer is −8x+20, but no option matches. Checking option D: $-8x+12 \neq -8x+20$.

6. C — The common difference is 11 − 18 = −7. Starting at 11, the next term is 11 + (−7) = 4. Continuing: 4 + (−7) = −3 ✓ and −3 + (−7) = −10 ✓. The missing term is 4, which corresponds to choice C.

7. C — The solid boundary line y = x + 1 means the inequality includes the boundary, so the symbol is ≥ or ≤. The solution region is above this solid line, so y ≥ x + 1. The dashed boundary line y = −(1/2)x + 5 excludes the boundary, and the region is below it, giving y < −(1/2)x + 5. Only choice C combines both correctly.

8. A — Solve $3x^2 - 27 = 0$: add 27 to both sides to get $3x^2 = 27$, divide by 3 to get $x^2 = 9$, then take the square root of both sides to get x = ±3. Both x = 3 and x = −3 are solutions; choice D omits the negative root and choice B incorrectly squares the answer.

9. A — When the mean exceeds the median, the data is pulled to the right by higher values in the upper tail — a characteristic of a right-skewed (positively skewed) distribution. The mean is sensitive to outliers and extreme high values, which inflate it above the resistant median. Choice B describes left skew, which is the opposite condition.

10. D — The 3rd term: $a_3 = 5(-2)^{(3-1)} = 5(4) = 20$. The 4th term: $a_4 = 5(-2)^{(4-1)} = 5(-8) = -40$. Sum = 20 + (−40) = −20. The alternating signs from a negative common ratio are essential to track — missing the negative on a_4 would produce the wrong sum.

11. B — Multiply the first equation 3x − y = 6 by 2: 6x − 2y = 12, which is identical to the second equation. When two equations simplify to the same line, every point on the line satisfies both — the system has

infinitely many solutions. Choice A has parallel lines (same slope, different intercepts), yielding no solution.

12. C — Class A's scores cluster in the higher intervals [70,90), with the distribution tail extending to the left toward lower scores — this is left-skewed. Class B's scores cluster in the lower intervals [50,70), with the tail extending right — this is right-skewed. Choice D is reversed: Class B is right-skewed, not left-skewed.

13. B — Distribute: $4x - 8 + 3x = 5x + 10 \rightarrow 7x - 8 = 5x + 10 \rightarrow 2x = 18 \rightarrow x = 9$. Verify: $4(9-2) + 3(9) = 28 + 27 = 55$ and $5(9) + 10 = 55$ ✓. Combining like terms on the left before moving variables is the key organizing step.

14. A — Check ratios: 22400/28000 = 0.80, 17920/22400 = 0.80, 14336/17920 = 0.80. The constant ratio of 0.80 confirms exponential decay with initial value 28,000 and base 0.80. Choice B is linear depreciation, which would subtract a fixed dollar amount each year rather than a fixed percentage.

15. D — Jaylen: $J(w) = 45 + 12w$. Priya: $P(w) = 10 + 19w$. Set $P(w) > J(w)$: $10 + 19w > 45 + 12w \rightarrow 7w > 35 \rightarrow w > 5$. At exactly $w = 5$, both have the same amount. Priya first exceeds Jaylen in week 6. Wait — checking: at $w = 5$: $J = 105$, $P = 105$. At $w = 6$: $J = 117$, $P = 124$. Priya first has MORE at $w = 6$, not $w = 7$. The key assigns D = 7 weeks, but the correct answer is $w = 6$ (choice C).

16. B — Factor out the GCF of x: $x^3 - 9x = x(x^2 - 9)$. Apply the difference of squares: $x^2 - 9 = (x - 3)(x + 3)$, giving the completely factored form $x(x - 3)(x + 3)$. Choice A incorrectly factors as a perfect square rather than a difference of squares.

17. C — The vertex of $f(x) = (x - 1)^2 + 2$ is (1, 2), and since $a = 1 > 0$, the parabola opens upward with vertex as the minimum. The function output is always ≥ 2, making the range $f(x) \geq 2$. Choice A (all real numbers) would be the domain, not the range of this quadratic.

18. C — Expand $(3x + 5)(x - 2)$ using FOIL: $3x^2 - 6x + 5x - 10 = 3x^2 - x - 10$. The outer product ($-6x$) and inner product ($+5x$) combine to give $-x$ as the middle term. Choice D incorrectly uses $+5x$ as the middle term instead of $-x$.

19. A — The predicted value at $x = 6$ is $\hat{y} = -3.2(6) + 58 = -19.2 + 58 = 38.8$. Residual = observed − predicted = $42 - 38.8 = 3.2$. A positive residual means the actual value exceeds the predicted value — the data point lies above the regression line.

20. A — From the table, f(x) increases by 3 for each unit increase in x — the rate of change is 3. Among the options, $g(x) = 4x - 1$ has slope 4, which is greater than 3. Choices B (slope 2) and C (slope 3) have rates less than or equal to 3, and choice D has a negative rate of change.

21. B — In vertex form $p(x) = a(x - h)^2 + k$, the vertex is (h, k). For $p(x) = 3(x - 2)^2 - 7$, $h = 2$ and $k = -7$, giving vertex $(2, -7)$. Since $a = 3 > 0$, the parabola opens upward. Choice C uses the wrong sign for h, and choice D incorrectly states the parabola opens downward.

22. B — Distribute: $-8x + 12 \geq 20 \rightarrow -8x \geq 8$. Divide by −8 and reverse the inequality sign: $x \leq -1$. The boundary is −1 with a closed circle, and the solution extends left. Choice C fails to reverse the inequality sign when dividing by a negative number.

23. C — Substitute $y = 2x + 3$ into $4x - y = 9$: $4x - (2x + 3) = 9 \rightarrow 2x - 3 = 9 \rightarrow 2x = 12 \rightarrow x = 6$. Then $y = 2(6) + 3 = 15$. Solution: (6, 15). Verify: $4(6) - 15 = 24 - 15 = 9$ ✓.

24. B — The five-number summary is: Min = 14, Q1 = 24, Median = 36, Q3 = 48, Max = 65. A value of 50 falls between Q3 = 48 and the maximum of 65, which places it in the 4th quartile (the upper 25% of the data). Wait — in standard quartile terminology, between Q3 and the maximum is indeed the 4th quartile. The key assigns B = 2nd quartile, but 50 > Q3 = 48, placing it in the 4th quartile.

25. D — From the table, f(x) has slope $(8-5)/(1-0) = 3$ and y-intercept 5: $f(x) = 3x + 5$. Function $g(x) = 5x - 1$ has slope 5. Since $5 > 3$, g(x) has the greater rate of change. Set equal: $3x + 5 = 5x - 1 \rightarrow 6 = 2x \rightarrow x = 3$. At x = 3: f(3) = 14 and g(3) = 14 ✓.

26. D — Vertex form with vertex (3, −4): $f(x) = a(x - 3)^2 - 4$. Substitute (5, 4): $4 = a(5-3)^2 - 4 \rightarrow 4 = 4a - 4 \rightarrow 8 = 4a \rightarrow a = 2$. Vertex form: $f(x) = 2(x - 3)^2 - 4$. Expand to standard form: $2(x^2-6x+9) - 4 = 2x^2 - 12x + 18 - 4 = 2x^2 - 12x + 14$.

27. C — Quadratic formula: $x = [7 \pm \sqrt{(49 + 72)}]/6 = [7 \pm \sqrt{121}]/6 = [7 \pm 11]/6$. Solutions: $x = 18/6 = 3$ and $x = -4/6 = -2/3$. Both are exact values requiring no further simplification. Identify a=3, b=−7, c=−6 carefully before substituting into the formula.

28. D — Set up P(t) = 15000(b)^t. At t=5, P=18000: 18000 = 15000(b)^5 → b^5 = 1.2 → b = 1.2^(1/5) ≈ 1.0371. So P(t) = 15000(1.0371)^t. At 2025, t = 15: P(15) = 15000(1.0371)^15 ≈ 15000(1.7241) ≈ 25,862 people.

29. B — Factor out −2: $f(x) = -2(x^2 - 6x) - 10$. Complete the square: half of −6 is −3; $(-3)^2 = 9$. Add and subtract: $-2(x^2 - 6x + 9) + 18 - 10 = -2(x - 3)^2 + 8$. Maximum height is 8 feet, occurring at x = 3 (when the input equals 3).

30. A — Ordered data: 5, 8, 12, 15, 17, 19, 22, 26, 30, 42. Min = 5, Max = 42. Median = (17+19)/2 = 18. Q1 = (8+12)/2 = 10. Q3 = (26+30)/2 = 28. IQR = 28 − 10 = 18. Upper fence = 28 + 1.5(18) = 28 + 27 = 55. Since 42 < 55, the value 42 is not an outlier.

31. B — Phase 1 ($0 \leq t \leq 2$): $D_1(t) = 40t$; at t = 2, D = 80 miles. Phase 2 ($2 \leq t \leq 2.5$): $D_2(t) = 80$ (stationary); no additional distance. Phase 3 ($2.5 \leq t \leq 4$): $D_3(t) = 80 + 60(t - 2.5)$; at t = 4, $D = 80 + 60(1.5) = 80 + 90 = 170$ miles. Total distance at end of trip: 170 miles.

32. B — Explicit formula: $a_n = -8 + (n-1)(6) = 6n - 14$. At n = 15: $a_{15} = 6(15) - 14 = 90 - 14 = 76$. Setting $a_n = 76$: $6n - 14 = 76 \rightarrow 6n = 90 \rightarrow n = 15$. Interestingly, $a_{15} = 76$, so the answer to part c is n = 15.

33. A — Table: x=0: f=1, g=0; x=1: f=2, g=8; x=2: f=4, g=16; x=3: f=8, g=24; x=4: f=16, g=32; x=5: f=32, g=40. From the table, g(x) exceeds f(x) for x = 1 through x = 5. At x = 6: f(6) = 64 and g(6) = 48 — f(x) first permanently exceeds g(x) at x = 6. Exponential functions grow by multiplication while linear

functions grow by addition; no matter how large the linear slope, repeated multiplication eventually produces a larger output than repeated addition.

34. C — Basketball: 55 total, 35 in 9th grade → 20 in 10th grade. Swimming: 95 total, 45 in 10th grade → 50 in 9th grade. Table: 9th/Basketball=35, 9th/Swimming=50, 9th Total=85; 10th/Basketball=20, 10th/Swimming=45, 10th Total=65; Grand Total=150. Of 9th graders: 35/85 ≈ 41.2% play basketball. Of 10th graders: 45/65 ≈ 69.2% swim. The conditional frequencies differ substantially (41.2% vs. 69.2%), indicating an association between grade level and sport — 10th graders are disproportionately more likely to swim.

35. A — $R(x) = 3.50x$. $C(x) = 1.20x + 120$. $P(x) = 3.50x - (1.20x + 120) = 2.30x - 120$. Break-even: $2.30x - 120 = 0 \rightarrow x = 120/2.30 \approx 52.17 \rightarrow$ must sell at least 53 cups. At $x = 80$: $P(80) = 2.30(80) - 120 = 184 - 120 = \$64$ profit — the shop is profitable at 80 cups. To double the profit to \$128: $2.30x - 120 = 128 \rightarrow 2.30x = 248 \rightarrow x \approx 107.8 \rightarrow 108$ cups. New model at \$4.00/cup with fixed cost \$150: $R_2(x) = 4x$, $C_2(x) = 1.20x + 150$, $P_2(x) = 2.80x - 150$. New break-even: $2.80x = 150 \rightarrow x \approx 53.57 \rightarrow 54$ cups. The new break-even (54 cups) is slightly higher than the original (53 cups) because the higher fixed cost slightly offsets the higher price per cup, though the profit margin per cup improved from \$2.30 to \$2.80.