

Algebra — Practice Set II

Systems of Equations and Linear Inequalities: Medium to Hard

6 Questions | Full Solutions | Mistake-Pattern Analysis

Question 1 [MEDIUM]

If $x + y = 10$ and $x - y = 2$, what is the value of y ?

- A) 2
- B) 4
- C) 6
- D) 8

Algebraic: Add the equations: $2x = 12$, so $x = 6$, then $y = 10 - 6 = 4$.

Desmos: Graph both lines, read the y -coordinate of the intersection point.

Faster path: Algebraic, elimination by addition takes one line.

Mistake: **Wording trap**: student solves correctly for x but reports x instead of the y -value the question actually asked for.

Question 2 [MEDIUM]

How many solutions does the system $2x + 3y = 6$ and $4x + 6y = 10$ have?

- A) No solution
- B) Exactly one solution
- C) Exactly two solutions
- D) Infinitely many solutions

Algebraic: Compare ratios: $4/2 = 2$ and $6/3 = 2$, so the left sides are proportional, but $10/6$ is not equal to 2, so the lines are parallel and distinct. No solution.

Desmos: Graph both lines and see that they never intersect.

Faster path: Algebraic, comparing three ratios takes ten seconds; solving the full system to discover it has no solution wastes a full minute.

Mistake: **Pacing error**: student attempts full elimination before checking ratios, eventually reaching a contradiction but only after unnecessary computation.

Question 3 [HARD]

Adult tickets cost \$8 and child tickets cost \$5. If 100 tickets were sold for a total of \$650, how many adult tickets were sold?

- A) 30
- B) 40
- C) 50
- D) 60

Algebraic: Let $a + c = 100$, so $c = 100 - a$. Substitute into $8a + 5c = 650$: $8a + 5(100 - a) = 650$, so $3a + 500 = 650$, giving $a = 50$.

Desmos: Graph both equations as lines in a and c , find the intersection.

Faster path: Algebraic, the substitution is short enough to do mentally.

Mistake: **Wording trap**: student sets up $8a + 5c = 650$ correctly but reports the number of child tickets instead of adult tickets, the value the question actually asked for.

Question 4 [MEDIUM]

If $-2x + 4 \leq 10$, which of the following describes all possible values of x ?

- A) $x \leq -3$
- B) $x \geq -3$
- C) $x \leq 3$
- D) $x \geq 3$

Algebraic: Subtract 4: $-2x \leq 6$. Divide by -2 and flip the inequality: $x \geq -3$.

Desmos: Graph both expressions and identify the x -range satisfying the inequality.

Faster path: Algebraic, but flip the sign carefully when dividing by a negative.

Mistake: **Concept gap**: student divides by -2 but forgets to flip the inequality sign, choosing option A.

Question 5 [MEDIUM]

A parking garage charges a \$5 entry fee plus \$3 per hour. Maya has at most \$20 to spend. What is the maximum number of whole hours she can park?

- A) 4
- B) 5
- C) 6
- D) 8

Algebraic: $5 + 3h \leq 20$, so $3h \leq 15$, giving $h \leq 5$. The maximum whole number of hours is 5.

Desmos: Graph $y = 5 + 3x$ and $y = 20$, find where the first stays at or below the second.

Faster path: Algebraic, a clean translation and two-step solve.

Mistake: **Wording trap**: student forgets to subtract the \$5 entry fee first and divides \$20 by \$3 directly, getting a maximum of 6.

Question 6 [HARD]

If $-3 < 2x + 1 < 9$, which of the following describes all possible values of x ?

- A) $-2 < x < 4$
- B) $-2 < x < 5$
- C) $-1 < x < 4$
- D) $-4 < x < 8$

Algebraic: Subtract 1 from all three parts: $-4 < 2x < 8$, then divide by 2: $-2 < x < 4$.

Desmos: Graph all three expressions and find the x -range where the middle one sits between the outer two.

Faster path: Algebraic, compound inequalities solve in one pass by treating all three parts together.

Mistake: **Pacing error**: student solves the left and right inequalities as two separate problems instead of operating on all three parts simultaneously, taking twice as long for the same result.