# SAT Math: Algebra, study guide and worked solutions

## What the SAT asks

The Algebra domain tests straight-line mathematics: linear equations, linear functions, lines in the xy-plane, systems of two linear equations and linear inequalities. These five skills carry about 15.75% of the whole test, which is about 15 of the 44 Math questions, roughly one Math question in three. Desmos is allowed on all of them, but the fastest students know the algebra and use Desmos to check or to skip long arithmetic.

## Linear equations in one variable

### Solve a linear equation in one variable, including one written from a context

A linear equation in one variable has one unknown, usually x, and x appears only to the first power: no $x^2$, no x in a denominator. Solving it means finding the one number that makes both sides equal. Whatever you do to one side, you do to the other. Work in this order:

1. Expand parentheses. Multiply every term inside, sign included: $-3(x - 4) = -3x + 12$.
2. Clear fractions by multiplying **every** term on both sides by the lowest common denominator (LCD).
3. Collect the x terms on one side and the numbers on the other.
4. Divide by the coefficient of x, then check in the original equation.

Word problems become the same kind of equation. Name the unknown, then translate. The most common pattern is **total = fixed amount + rate × number of units**. A fixed amount (a joining fee, a delivery charge) stands alone. A rate (rupees per week) is multiplied by the unknown.

**Worked example 1 (fractions)**

Solve $(2x - 1)/3 + x/2 = 9$.

1. The LCD of 3 and 2 is 6. Multiply every term by 6: $2(2x - 1) + 3x = 54$.
2. Expand: $4x - 2 + 3x = 54$.
3. Collect like terms: $7x - 2 = 54$.
4. Add 2: $7x = 56$. Divide by 7: $x = 8$.

**Check:** $(16 - 1)/3 + 8/2 = 5 + 4 = 9$. Correct.

**Desmos route:** type the equation exactly as written. Desmos draws a vertical line at x = 8; click it to read the value.

**Worked example 2 (context)**

A gym charges a joining fee of 1,000 rupees plus 250 rupees per week. Ayesha has paid 3,250



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123
Scan: free demo class

rupees in total. For how many weeks has she been a member?

1. Let w be the number of weeks. Equation: 1,000 + 250w = 3,250.
2. Subtract 1,000: 250w = 2,250.
3. Divide by 250: w = 9.

**Check:** 1,000 + 250 × 9 = 3,250. Correct.

**Fastest route:** remove the fee (3,250 – 1,000 = 2,250), then divide by the rate (2,250 ÷ 250 = 9).

### Decide how many solutions a linear equation has

Most linear equations have exactly one solution. But sometimes the x terms cancel when you simplify. If what is left is false, such as 2 = –7, there is **no solution**. If what is left is true, such as –8 = –8, every x works and there are **infinitely many solutions**.

You can decide without solving. Simplify both sides to ax + b = cx + d and compare:

| Compare | Solutions | Example |
|---|---|---|
| a ≠ c | exactly one | 5x + 1 = 2x + 7 |
| a = c and b ≠ d | none | 4x + 3 = 4x – 1 |
| a = c and b = d | infinitely many | 4x + 3 = 4x + 3 |

The SAT often puts an unknown constant in the equation and asks which value gives no solution or infinitely many. Make the x coefficients equal first, then look at the constants.

**Worked example 3**

How many solutions does each equation have? (a) 4(3x – 2) – 2x = 10x – 8 (b) 2(5x + 1) = 10x – 7. (c) For what value of the constant a does 3(ax + 2) = 12x + 5 have no solution?

1. (a) Expand: 12x – 8 – 2x = 10x – 8, so 10x – 8 = 10x – 8. Both sides are identical: infinitely many solutions.
2. (b) Expand: 10x + 2 = 10x – 7. The x terms match but 2 ≠ –7. Subtracting 10x leaves 2 = –7, which is false: no solution.
3. (c) Expand: 3ax + 6 = 12x + 5. For no solution the x coefficients must match: 3a = 12, so a = 4. The constants 6 and 5 differ, so a = 4 gives no solution.

**Check (a):** x = 0 gives –8 on both sides, and x = 1 gives 2 on both sides, as expected.

**SAT trap: answering the wrong question**

Many questions ask for an expression such as 3x – 2 or x/2 + 1, not x. If x = 8 and the question asks for x/2 + 1, the answer is 5, and 8 will be among the options. Underline what is asked before you start. Also watch the minus sign before parentheses: –2(x – 3) = –2x + 6, not –2x – 6.



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

## Linear functions

### Interpret the slope and intercept of a linear function in context

A linear function is written f(x) = mx + b. Its graph is a straight line, and its output changes by the same amount every time the input goes up by 1.

- **m, the slope:** the rate of change, how much the output rises (positive m) or falls (negative m) for each extra unit of input. Its unit is output unit per input unit, for example rupees per gigabyte.
- **b, the y-intercept:** the output when the input is 0, usually the starting amount.
- **The x-intercept:** the input that makes the output 0, often the moment something runs out.

When asked what a number means, look at where it sits. Multiplied by the variable: a rate. Standing alone: a starting value. Then say what the input and output are, with units.

**Worked example 4**

A water tank is being drained. The volume left, in liters, t minutes after draining starts is V(t) = 1,800 – 45t. Interpret 1,800, –45, V(10) and the t-intercept.

1. 1,800 stands alone, so it is V(0): the tank held 1,800 liters at the start.
2. –45 is multiplied by t: the volume falls by 45 liters each minute.
3. V(10) = 1,800 – 450 = 1,350: after 10 minutes, 1,350 liters are left.
4. t-intercept: 1,800 – 45t = 0, so 45t = 1,800 and t = 40. The tank is empty after 40 minutes.

**Check:** 45 × 40 = 1,800 liters, the whole tank. Correct.

### Write or evaluate a linear function from a table, graph description or context

To build a linear function, find the slope first, then b.

1. Take two points. Slope m = $(y_2 – y_1)/(x_2 – x_1)$.
2. Put m and one point into y = mx + b and solve for b. If a point has x = 0, its y value is b.
3. Check with a third point. In a linear table, equal steps in x give equal steps in y.

If the x values in a table do not go up by 1, the change between rows is not the slope. Divide by the change in x.

**Worked example 5**

The table shows the taxi fare F(d), in rupees, for a ride of d kilometers. F is linear. What is F(12)?

| **d (km)** | 2 | 5 | 9 |
|---|---|---|---|
| **F(d) (rupees)** | 230 | 410 | 650 |

1. Slope: (410 – 230)/(5 – 2) = 180/3 = 60 rupees per kilometer.
2. Check with the last two columns: (650 – 410)/(9 – 5) = 240/4 = 60. Same slope.
3. Find b from (2, 230): 230 = 60(2) + b, so b = 110.
4. F(d) = 60d + 110: a fixed charge of 110 rupees plus 60 rupees per kilometer.



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

5. F(12) = 720 + 110 = 830 rupees.

**Desmos route:** make a table with $x_1$ = 2, 5, 9 and $y_1$ = 230, 410, 650, then type $y_1 \sim mx_1 + b$. Desmos shows m = 60 and b = 110. This saves most time when the numbers are awkward.

**SAT trap: slope or intercept?**

In C(g) = 75g + 500, the 500 is not the cost per unit: it is not multiplied by anything, so it is the cost when g = 0. The 75 is the change per unit. Wrong options often give the right number with the wrong meaning, so read each option's words. Also check the input unit: if t is in hours, the slope is a change per hour.

## Linear equations in two variables

### Write and interpret a linear equation in two variables

An equation such as 3x + 2y = 12 has many solutions, each a pair (x, y): (4, 0), (2, 3), (0, 6) and more. Together they form a straight line. Two forms appear most often:

- **Slope-intercept form**, y = mx + b: the slope and y-intercept can be read at once.
- **Standard form**, Ax + By = C: natural when two kinds of item share one total (price × number + price × number = total).

A point lies on a line only if its coordinates make the equation true.

**Worked example 6**

A shop sells notebooks for 150 rupees and pens for 40 rupees. Bilal spends exactly 1,200 rupees on n notebooks and p pens. Write an equation and interpret its intercepts and slope.

1. Equation: 150n + 40p = 1,200.
2. Set p = 0: 150n = 1,200, so n = 8. With no pens he can buy 8 notebooks.
3. Set n = 0: 40p = 1,200, so p = 30. With no notebooks he can buy 30 pens.
4. Solve for p: p = 30 – (15/4)n. The slope –15/4 means every 4 extra notebooks cost 15 pens (4 × 150 = 600 = 15 × 40).

**Check a pair:** n = 4, p = 15 gives 600 + 600 = 1,200. Correct.

### Find slopes, intercepts and parallel or perpendicular lines

- Ax + By = C has slope –A/B. If in doubt, rearrange to y = ... first.
- x-intercept: set y = 0. y-intercept: set x = 0.
- Line through $(x_1, y_1)$ with slope m: $y - y_1 = m(x - x_1)$.
- **Parallel** lines: same slope, different y-intercepts.
- **Perpendicular** lines: slopes multiply to –1. Flip the fraction and change the sign: 5/2 becomes –2/5.
- A horizontal line y = k has slope 0; a vertical line x = k has no defined slope.

**Worked example 7**



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

Line q is 5x – 2y = 20. (a) Find its slope and intercepts. (b) Find the line parallel to q through (2, 1). (c) Find the line perpendicular to q through (–5, 3).

1. (a) –2y = –5x + 20, so y = (5/2)x – 10. Slope 5/2, y-intercept (0, –10). Set y = 0: 5x = 20, so the x-intercept is (4, 0).
2. (b) Same slope 5/2: y – 1 = (5/2)(x – 2), so y = (5/2)x – 4.
3. (c) Perpendicular slope: –1 ÷ (5/2) = –2/5. y – 3 = (–2/5)(x + 5), so y = (–2/5)x – 2 + 3 = (–2/5)x + 1.

**Check:** (b) at x = 2: 5 – 4 = 1. (c) at x = –5: 2 + 1 = 3, and (5/2) × (–2/5) = –1. Correct.

**Desmos route:** type 5x – 2y = 20 as written and click where it crosses the axes to read the intercepts.

**SAT trap: the slope in standard form**

In 3x – 5y = 10 the slope is not 3. Rearrange: y = (3/5)x – 2, so the slope is 3/5 (and –A/B = –3/(–5) = 3/5 agrees). For perpendicular lines, students often flip but forget to change the sign, or change the sign but forget to flip. You need both.

## Systems of two linear equations

### Solve a system of two linear equations

A system asks for the pair (x, y) that makes both equations true at once. On a graph, it is the point where the two lines cross.

- **Substitution:** use it when one equation already gives y = ... or x = .... Put that expression into the other equation.
- **Elimination:** use it when both are in the form ax + by = c. Multiply so one variable has matching coefficients, then add or subtract to remove it.

Two shortcuts: if the question asks for x + y or x – y, try adding or subtracting the equations as they stand. In a word problem about two kinds of item, write one equation for the count and one for the total value.

**Worked example 8**

Solve 3x + 4y = 2 and 5x – 2y = 38.

1. Multiply the second equation by 2: 10x – 4y = 76.
2. Add it to the first: 13x = 78, so x = 6.
3. Put x = 6 into the first equation: 18 + 4y = 2, so 4y = –16 and y = –4.

**Check in both:** 18 – 16 = 2 and 30 + 8 = 38. The solution is (6, –4).

**Desmos route:** type both equations as they are and click the crossing point. On the SAT this is often the fastest method when the numbers are not friendly.

### Decide when a system has no solution or infinitely many solutions



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

Two lines can cross once (different slopes), never meet (parallel: same slope, different intercepts: **no solution**) or be the same line (**infinitely many solutions**). For $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$:

| Ratios | Solutions |
|---|---|
| $a_1/a_2 \neq b_1/b_2$ | exactly one |
| $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ | none |
| $a_1/a_2 = b_1/b_2 = c_1/c_2$ | infinitely many |

In plain words: if one whole equation is a multiple of the other, there are infinitely many solutions. If only the left sides are multiples, there is none.

**Worked example 9**

The system is $2x - 5y = 7$ and $cx - 15y = d$. (a) For what c and d are there infinitely many solutions? (b) How many solutions are there if $c = 6$ and $d = 20$?

1. The y coefficients: $-15 \div (-5) = 3$, so the second equation must be 3 times the first.
2. (a) $c = 3 \times 2 = 6$ and $d = 3 \times 7 = 21$.
3. (b) The left side $6x - 15y$ is 3 times $2x - 5y$, but $20 \neq 21$. $6x - 15y$ cannot equal both 21 and 20, so there is no solution.

**Check by slopes:** both lines have slope 2/5, with y-intercepts $-7/5$ and $-4/3$. Parallel, so no solution. Correct.

**SAT trap: equal ratios are not the end**

When the x and y coefficients are in the same ratio, many students write "no solution" at once. Check the constants too: if they are in the same ratio as well, it is one line with infinitely many solutions. Write both equations the same way round (x term, y term, constant on the right) before comparing.

## Linear inequalities

### Write, solve and interpret linear inequalities in one or two variables

An inequality uses $<$, $>$, $\leq$ or $\geq$, and its solution is a range of values. Solve it like an equation, with one extra rule: **when you multiply or divide both sides by a negative number, reverse the sign.** $<$ and $>$ leave out the boundary value; $\leq$ and $\geq$ include it.

| Words | Symbol |
|---|---|
| at most, no more than, maximum, a budget of | $\leq$ |
| at least, no less than, minimum | $\geq$ |
| more than, exceeds / fewer than | $>$ / $<$ |

If the answer must be a whole number (people, boxes), round in the direction that still satisfies the inequality, not to the nearest whole number. With two variables, $y \geq 2x + 1$ describes the line and the



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

whole region above it. A point solves a system only if it makes **every** inequality true, so substitute it into each one.

**Worked example 10**

Solve (a) $-3x + 7 \le 22$ and (b) $-4 < 2x + 6 \le 10$.

1. (a) Subtract 7: $-3x \le 15$. Divide by $-3$ and reverse the sign: $x \ge -5$.
2. (b) Subtract 6 from all three parts: $-10 < 2x \le 4$. Divide all parts by 2: $-5 < x \le 2$.

**Check (a):** $x = 0$ gives $7 \le 22$, true. $x = -6$ gives $25 \le 22$, false. Correct.

**Worked example 11 (context)**

Saad has 5,000 rupees. He buys a bus pass for 1,300 rupees and wants to spend the rest on books at 450 rupees each. What is the greatest number of books he can buy?

1. $1{,}300 + 450b \le 5{,}000$.
2. Subtract 1,300: $450b \le 3{,}700$. Divide by 450: $b \le 8.22$ (to two decimal places).
3. b is a whole number, so round **down**: 8 books.

**Check:** $1{,}300 + 3{,}600 = 4{,}900 \le 5{,}000$, but 9 books cost $1{,}300 + 4{,}050 = 5{,}350$.

**Worked example 12 (two variables)**

A baker has at most 12 hours. A cake takes 1.5 hours and a pie 0.75 hours. Write an inequality for c cakes and p pies. Are 5 cakes and 6 pies possible?

1. $1.5c + 0.75p \le 12$.
2. Test (5, 6): $7.5 + 4.5 = 12$, and $12 \le 12$ is true ($\le$ includes the boundary). Yes, using all 12 hours.

**Desmos route:** type each inequality; the overlap of the shaded regions is the solution set. Type a point to see whether it lands inside. A dashed boundary means $<$ or $>$; a solid one means $\le$ or $\ge$.

**SAT trap: the sign and the rounding**

Forgetting to reverse the sign after dividing by a negative is the most common mistake, and that wrong answer will be an option. Test one number from your answer in the original. In context, if $b \le 8.9$ the greatest whole number is 8, not 9; if you need at least 8.1 buses, you need 9.

## Practice set

Questions 1 to 11 are multiple choice. Questions 12 to 14 are student-produced responses: type your answer. Aim for 60 to 90 seconds each.

**1.** $3(x + 4) - 5 = x + 15$. What is the value of x?

A) 2
B) 4
C) 8



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

D) 11

**2.** The monthly cost, in rupees, of a mobile data plan is C(g) = 120g + 600, where g is the number of gigabytes used beyond the basic allowance. What is the best interpretation of 120 in this context?

A) The monthly cost before any extra gigabytes are used
B) The total monthly cost when 120 extra gigabytes are used
C) The number of extra gigabytes used in a month
D) The cost of each extra gigabyte

**3.** What is the slope of the line 4x – 6y = 18 in the xy-plane?

A) –3
B) –2/3
C) 2/3
D) 4

**4.** In the equation 5(2x – 3) + k = 10x + 4, k is a constant. For what value of k does the equation have infinitely many solutions?

A) –11
B) 4
C) 7
D) 19

**5.** The table shows three values of the linear function f. What is the value of f(10)?

| **x** | 1 | 3 | 7 |
|---|---|---|---|
| **f(x)** | 2 | 8 | 20 |

A) 23
B) 29
C) 30
D) 32

**6.** A school canteen sells samosas for 40 rupees each and cartons of juice for 60 rupees each. One day its sales were 5,000 rupees from s samosas and j cartons, so 40s + 60j = 5,000. If 40 cartons of juice were sold, how many samosas were sold?

A) 65
B) 85
C) 110
D) 125

**7.** A drama club sold 120 tickets. Adult tickets cost 500 rupees and student tickets cost 300 rupees. Sales came to 44,000 rupees. How many student tickets were sold?

A) 40
B) 60
C) 80
D) 88

**8.** A delivery van can carry a total load of at most 900 kilograms, including the driver. The driver weighs 75 kilograms and each box weighs 24 kilograms. What is the greatest number of boxes the van can



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

carry on one trip?

A) 34
B) 35
C) 37
D) 38

**9.** In the xy-plane, line $\ell$ passes through (8, 3) and is perpendicular to the line $4x + 5y = 10$. Line $\ell$ crosses the y-axis at (0, b). What is the value of b?

A) –7
B) –3.4
C) 9.4
D) 13

**10.** In the system below, k is a constant.

$6x - ky = 9$
$4x + 3y = 5$

For what value of k does the system have no solution?

A) –27/5
B) –9/2
C) –2
D) 9/2

**11.** Which point (x, y) is a solution to the system of inequalities $y > 2x - 3$ and $y \le -x + 6$?

A) (3, 3)
B) (4, 2)
C) (–1, 8)
D) (2, 3)

**12.** $(x + 1)/3 - (x - 3)/5 = 2$. What is the value of x?

**13.** $7x + 3y = 41$ and $3x + 7y = 49$. What is the value of $x + y$?

**14.** For the linear function g, $g(-2) = 13$ and $g(4) = -5$. The graph of $y = g(x)$ crosses the x-axis at (a, 0). What is the value of a?

## Solutions

**1. Answer: B**

1. Expand: $3x + 12 - 5 = x + 15$, so $3x + 7 = x + 15$.
2. Subtract x: $2x + 7 = 15$. Subtract 7: $2x = 8$, so $x = 4$.
3. Check: $3(8) - 5 = 19$ and $4 + 15 = 19$.

Traps: 2 comes from adding x instead of subtracting it; 8 from not multiplying the 4 by 3; 11 from adding 7 instead of subtracting it.

Skill: Linear equations in one variable

**2. Answer: D**



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

1. 120 is multiplied by g, the number of extra gigabytes, so it is a rate.
2. Each extra gigabyte adds 120 rupees: C(g + 1) – C(g) = 120.

Traps: A describes 600, the value at g = 0. B describes C(120) = 15,000. C confuses the rate with the input g.

Skill: Linear functions

**3. Answer: C**

1. Subtract 4x: –6y = –4x + 18.
2. Divide by –6: y = (2/3)x – 3. The slope is 2/3.
3. Check with –A/B: –4/(–6) = 2/3.

Traps: –3 is the y-intercept; –2/3 loses a minus sign; 4 is read straight from the x coefficient.

Skill: Linear equations in two variables

**4. Answer: D**

1. Expand: 10x – 15 + k = 10x + 4.
2. The x terms match, so the constants must match: –15 + k = 4, so k = 19.
3. Check: with k = 19 the left side is 10x + 4, identical to the right.

Traps: –11 comes from 4 – 15; 4 ignores the –15; 7 comes from not multiplying –3 by 5.

Skill: Linear equations in one variable

**5. Answer: B**

1. Slope: (8 – 2)/(3 – 1) = 3. Check: (20 – 8)/(7 – 3) = 3.
2. From (1, 2): 2 = 3 + b, so b = –1 and f(x) = 3x – 1.
3. f(10) = 30 – 1 = 29.

Fast route: from x = 7 to x = 10 is 3 steps, so add 3 × 3 = 9 to 20.

Traps: 23 adds the slope only once; 30 forgets b; 32 takes f(1) = 2 as the y-intercept.

Skill: Linear functions

**6. Answer: A**

1. Substitute j = 40: 40s + 2,400 = 5,000.
2. Subtract 2,400: 40s = 2,600. Divide by 40: s = 65.
3. Check: 2,600 + 2,400 = 5,000.

Traps: 85 prices juice at 40 rupees; 110 subtracts 60 only once; 125 ignores the juice (5,000 ÷ 40).

Skill: Linear equations in two variables

**7. Answer: C**

1. Let a be adult and s student tickets. Count: a + s = 120, so a = 120 – s.
2. Value: 500(120 – s) + 300s = 44,000, so 60,000 – 200s = 44,000.
3. 200s = 16,000, so s = 80 and a = 40.



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

4. Check: 40 × 500 + 80 × 300 = 20,000 + 24,000 = 44,000.

Traps: 40 is the adult count; 60 is half of 120; 88 treats every ticket as adult (44,000 ÷ 500).

Skill: Systems of two linear equations

**8. Answer: A**

1. Let n be the number of boxes: 75 + 24n ≤ 900.
2. Subtract 75: 24n ≤ 825. Divide by 24: n ≤ 34.375.
3. n is a whole number, so round down: 34.
4. Check: 75 + 816 = 891 ≤ 900, but 35 boxes give 75 + 840 = 915.

Traps: 35 rounds up and breaks the limit; 37 and 38 forget the driver (900 ÷ 24 = 37.5).

Skill: Linear inequalities

**9. Answer: A**

1. 4x + 5y = 10 gives y = (–4/5)x + 2, slope –4/5.
2. Perpendicular slope: –1 ÷ (–4/5) = 5/4.
3. Through (8, 3): y – 3 = (5/4)(x – 8), so y = (5/4)x – 10 + 3 = (5/4)x – 7. So b = –7.
4. Check: (5/4)(8) – 7 = 3, and (–4/5)(5/4) = –1.

Traps: –3.4 uses slope 4/5 (sign changed, not flipped); 9.4 uses –4/5 (the parallel line); 13 uses –5/4 (flipped, sign not changed).

Skill: Linear equations in two variables

**10. Answer: B**

1. No solution means the x and y coefficients are in the same ratio but the constants are not.
2. x ratio: 6/4 = 3/2. So (–k)/3 = 3/2, giving –k = 9/2 and k = –9/2.
3. Constants: 9/5 = 1.8 ≠ 1.5, so the lines are parallel and distinct.
4. Check by slopes: 4x + 3y = 5 has slope –4/3. With k = –9/2, 6x + (9/2)y = 9 has slope –6 ÷ (9/2) = –4/3.

Traps: –27/5 matches the y ratio to the constants' ratio 9/5; –2 turns the x ratio upside down; 9/2 loses the minus sign.

Skill: Systems of two linear equations

**11. Answer: D**

1. First inequality at (2, 3): 2(2) – 3 = 1, and 3 > 1 is true.
2. Second at (2, 3): –2 + 6 = 4, and 3 ≤ 4 is true. Both hold.

Traps: (3, 3) lies on the boundary of the strict inequality (3 > 3 is false). (4, 2) fails the first (2 > 5 is false). (–1, 8) passes the first but fails the second (8 ≤ 7 is false).

Skill: Linear inequalities

**12. Answer: 8**

1. Multiply every term by 15: 5(x + 1) – 3(x – 3) = 30.



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com

2. Expand, minding the minus sign: 5x + 5 – 3x + 9 = 30, so 2x + 14 = 30.
3. 2x = 16, so x = 8.
4. Check: 9/3 – 5/5 = 3 – 1 = 2.

Accepted answer: 8. A common wrong answer is 17, from writing –3(x – 3) as –3x – 9.

Skill: Linear equations in one variable

**13. Answer: 9**

1. Add the equations: 10x + 10y = 90.
2. Divide by 10: x + y = 9.
3. Check: subtracting gives 4x – 4y = –8, so x – y = –2, giving x = 3.5 and y = 5.5. Then 24.5 + 16.5 = 41 and 10.5 + 38.5 = 49.

Accepted answer: 9. The question asks for x + y, so adding is faster than finding x and y.

Skill: Systems of two linear equations

**14. Answer: 7/3**

1. Slope: (–5 – 13)/(4 – (–2)) = –18/6 = –3.
2. g(x) = –3x + b and g(–2) = 13: 6 + b = 13, so b = 7. Check: g(4) = –12 + 7 = –5.
3. Set g(a) = 0: –3a + 7 = 0, so a = 7/3.

Accepted answers: 7/3 or 2.333 (enter as many digits as the box allows; 2.33 is not precise enough). A common wrong answer is 7, the y-intercept.

Skill: Linear functions



MEGA LECTURE · Stuck on this topic? Free 1-on-1 demo class WhatsApp a tutor +92 336 7801123 megalecture.com