Linear equations and functions

Math / Algebra / Linear equations in one variable / Linear functions

Prerequisites: Arithmetic, negative numbers and the distributive property

Level: Foundational to intermediate instruction

Coverage: 12 original questions: 1 diagnostic, 3 worked examples, 3 guided, 3 independent, 1 exit ticket and 1 extension. Selected skill coverage, not the complete SAT syllabus.

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Teacher answer edition

Use the diagnostic to identify prerequisites. Model examples before guided practice. Treat the exit ticket as a brief check, not a calibrated mastery score.

Question 1

If 3x + 6 = 21, what is x?

A. 3

B. 5

C. 7

D. 9

Answer: B

A: 3 gives 15, not 21.

B: Subtract 6: 3x = 15. Divide by 3: x = 5.

C: 7 results from dividing 21 before removing the 6.

D: 9 gives 33, not 21.

Question 2

If 2(x - 4) = 10, what is x?

A. 1

B. 5

C. 9

D. 14

Answer: C

A: 1 gives -6, not 10.

B: 5 gives 2, not 10.

C: Divide by 2: x - 4 = 5. Add 4: x = 9.

D: 14 adds 4 to 10 without first dividing by 2.

Question 3

A tutor charges a $15 booking fee and $30 per hour. Which equation gives cost C for h hours?

A. C = 15h + 30

B. C = 30h + 15

C. C = 45h

D. C = 30h - 15

Answer: B

A: This reverses the fixed fee and hourly rate.

B: 30h is the hourly charge. Add the one-time $15 fee.

C: This incorrectly charges the booking fee every hour.

D: This subtracts a fee that the customer must pay.

Question 4

A line passes through (1, 2) and (4, 11). What is its slope?

A. 1/3

B. 3

C. 9

D. 13/5

Answer: B

A: 1/3 reverses change in y divided by change in x.

B: Slope = (11 - 2)/(4 - 1) = 9/3 = 3.

C: 9 is the change in y, without dividing by change in x.

D: 13/5 uses sums rather than differences.

Question 5

If 5x - 2 = 3x + 8, what is 2x?

A. 5

B. 6

C. 10

D. 20

Answer: C

A: 5 is x, while the prompt asks for 2x.

B: 6 does not satisfy the equation for 2x.

C: Subtract 3x and add 2: 2x = 10.

D: 20 doubles the already requested value 2x = 10.

Question 6

Which equation describes a line parallel to y = 4x that passes through (2, 5)?

A. y = 4x - 3

B. y = 4x + 3

C. y = 2x + 5

D. y = x/4 + 5

Answer: A

A: Parallel lines have slope 4. 5 = 8 + b gives b = -3.

B: At x = 2 this gives 11, not 5.

C: Slope 2 is not parallel to slope 4.

D: Slope 1/4 is not parallel to slope 4.

Question 7

How many real solutions does $2(x + 3) = 2x + 6$ have?

A. None

B. One

C. Two

D. Infinitely many

Answer: D

A: Distribution produces an identity, not a contradiction.

B: No single x is distinguished by the identity.

C: Every real x works, not just two values.

D: Both sides simplify to $2x + 6$, so every real x works.

Question 8

If (x + 3)/4 = 5, what is x?

A. 2

B. 8

C. 17

D. 23

Answer: C

A: Subtracting before removing the division changes the equation.

B: 8 gives 11/4, not 5.

C: Multiply by 4: x + 3 = 20. Subtract 3: x = 17.

D: 23 adds 3 when it should be subtracted.

Question 9

A tank contains 50 liters and drains at 2 liters per minute. Which expression gives its volume after t minutes, before it empties?

A. 50 + 2t

B. 2t - 50

C. 50 - 2t

D. 25 - t

Answer: C

A: This models filling rather than draining.

B: This starts at a negative volume.

C: Starting volume minus drained volume is 50 - 2t.

D: This gives time remaining, not volume in liters.

Question 10

How many real solutions does 3x + 1 = 3x + 4 have?

A. None

B. One

C. Three

D. Infinitely many

Answer: A

A: Subtracting 3x gives 1 = 4, a contradiction.

B: No x can make 1 equal 4.

C: The coefficient 3 does not determine solution count.

D: An identity would have equal constants, which these do not.

Question 11

The line y = -2x + 7 has what y-intercept?

A. -2

B. 2

C. 5

D. 7

Answer: D

A: -2 is the slope.

B: 2 is the slope magnitude, not the intercept.

C: 5 is y when x = 1, not x = 0.

D: At x = 0, y = 7, so the y-intercept is 7.

Question 12

For y = 3x + b, the point (4, 17) lies on the line. What is b?

A. 5

B. 12

C. 17

D. 29

Answer: A

A: 17 = 3(4) + b, so b = 5.

B: 12 is the 3x term at x = 4.

C: 17 ignores the contribution from 3x.

D: 29 adds 12 instead of subtracting it.