

Algebra 1 Final Exam Review

Everything on a typical Algebra 1 final, one unit at a time: the rules you need, the mistakes that cost the most points, and three practice questions per unit with answers. Start with the quick checks to find your weak units, then use the linked lessons to fix them.

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What’s on the Algebra 1 final

Most schools teach equations, inequalities, functions and systems in the first semester, then exponents, polynomials, quadratics and statistics in the second. If your final is in December, focus on the Semester 1 units.

Unit	Usually on	Lessons
1. Signed numbers & expressions	Semester 1	Algebra I: Signed Numbers & Absolute Value, Introduction to Algebra
2. Linear equations & formulas	Semester 1	Algebra I: Linear Equations & Formulas
3. Linear inequalities	Semester 1	Algebra I: Systems & Linear Inequalities
4. Functions & linear models	Semester 1	Algebra I: Function Notation & Linear Models, Functions & Patterns
5. Systems of equations	Semester 1	Algebra I: Systems & Linear Inequalities, Systems of Linear Equations
6. Exponents & exponential functions	Semester 2	Exponents & Scientific Notation
7. Polynomials & factoring	Semester 2	Algebra I: Polynomial Operations
8. Quadratic functions & equations	Semester 2	Algebra I: Quadratics

Unit	Usually on	Lessons
9. Statistics & data	Semester 2	Statistics: Data, Models & Chance, Scatter Plots & Bivariate Data

A two-week study plan

DAY 14

Find your weak units

Do the quick checks for all 9 units without notes. Mark each unit solid, shaky or lost. This tells you where your study time goes.

DAYS 13–6

Fix the lost and shaky units, one a day

Start with the units you marked lost, then shaky. For each one, read the must-know list, work through the linked lesson, and redo that unit's quick checks until you get all three right.

DAYS 5–3

Mixed practice

Finals mix units together, so practice that way: pick problems from different units, work them without looking at which unit they came from, and check each answer.

DAY 2

Formulas and mistakes

Review the formula sheet and every "common mistakes" list. Write out from memory the formulas you still look up.

DAY 1

Light review and sleep

Redo only the questions you missed before. Then stop: a full night of sleep helps your memory more than a late cram session.

UNIT 1 · SEMESTER 1

Signed numbers & expressions

MUST KNOW

- Order of operations: grouping symbols, exponents, then multiply and divide left to right, then add and subtract left to right.
- Adding signed numbers: same signs add and keep the sign; different signs subtract and take the sign of the number with the larger absolute value.
- Multiplying or dividing two negatives gives a positive; one negative gives a negative.
- Absolute value is distance from zero, so it is never negative: $|-7| = 7$.
- Distribute to every term, $a(b + c) = ab + ac$, and combine only like terms: $3x + 5x = 8x$, but $3x + 5x^2$ cannot be combined.

COMMON MISTAKES

- Writing $-3^2 = 9$. Without parentheses the exponent comes first, so $-3^2 = -9$, while $(-3)^2 = 9$.
- Distributing to only the first term. $-2(x - 4)$ is $-2x + 8$: the negative multiplies the -4 too.

QUICK CHECK

1.1 Simplify $-4 + 9 - (-6)$.

1.2 Simplify $3(2x - 5) - 4x$.

1.3 Evaluate $2x^2 - x$ when $x = -3$.

UNIT 2 · SEMESTER 1

Linear equations & formulas

MUST KNOW

- Undo operations in reverse order, doing the same thing to both sides.
- With variables on both sides, collect the variable terms on one side first.
- Clear fractions by multiplying every term on both sides by the least common denominator.
- An equation can have one solution, no solution (you end with something false like $0 = 5$) or infinitely many (you end with something true like $0 = 0$).
- Literal equations are solved the same way for a named variable: $A = lw$ gives $w = \frac{A}{l}$.

COMMON MISTAKES

- Multiplying only some terms when clearing fractions. Every term on both sides gets multiplied.
- Dropping the negative in front of parentheses: $5 - (x + 2)$ is $3 - x$, not $7 + x$.

QUICK CHECK

2.1 Solve $4x - 7 = 2x + 9$.

2.2 Solve $\frac{x}{3} + 2 = 6$.

2.3 Solve $P = 2l + 2w$ for w .

UNIT 3 · SEMESTER 1

Linear inequalities

MUST KNOW

- Solve an inequality like an equation, except flip the sign when you multiply or divide both sides by a negative number.
- On a number line, use an open circle for $<$ or $>$ and a closed circle for $\leq$ or $\geq$.
- "And" compound inequalities describe values between two numbers, like $-2 < x \leq 5$; "or" inequalities describe values outside them.
- Absolute value: $|x| < 4$ means $-4 < x < 4$, and $|x| > 4$ means $x < -4$ or $x > 4$.
- To graph $y > 2x + 1$, draw a dashed line and shade above it; use a solid line for $\geq$ or $\leq$.

COMMON MISTAKES

- Forgetting to flip the sign: $-3x > 12$ becomes $x < -4$, not $x > -4$.
- Drawing a solid boundary line for a strict inequality ($<$ or $>$). Those points are not solutions, so the line is dashed.

QUICK CHECK

3.1 Solve $5 - 2x \geq 11$.

3.2 Solve $-1 < 2x + 3 \leq 9$.

3.3 Solve $|x - 2| \leq 5$.

UNIT 4 · SEMESTER 1

Functions & linear models

MUST KNOW

- A function gives each input exactly one output; its graph passes the vertical line test.
- Function notation: $f(3)$ is the output when the input is 3. It does not mean f times 3.
- Slope is the rate of change: $m = \frac{y_2 - y_1}{x_2 - x_1}$.
- Slope-intercept form is $y = mx + b$, point-slope form is $y - y_1 = m(x - x_1)$, and standard form is $Ax + By = C$.
- Parallel lines have equal slopes; perpendicular slopes are negative reciprocals, like 2 and $-\frac{1}{2}$.
- In a word problem, the slope is the rate (per hour, per ticket) and the y -intercept is the starting amount.

COMMON MISTAKES

- Putting the change in x on top of the slope fraction. Slope is rise over run: change in y over change in x .
- Subtracting the coordinates in a different order on the top and the bottom, which flips the sign of the slope.

QUICK CHECK

4.1 If $f(x) = 3x - 4$, find $f(-2)$.

4.2 Find the slope of the line through $(1, 5)$ and $(4, -1)$.

4.3 Write the line with slope 3 through $(2, 1)$ in slope-intercept form.

Systems of equations

MUST KNOW

- The solution of a system is the point that makes both equations true: where the lines cross.
- Substitution: solve one equation for a variable, then substitute that expression into the other equation.
- Elimination: add or subtract the equations, multiplying one or both first if needed, so one variable cancels.
- Lines with the same slope and different intercepts are parallel, so there is no solution; the same line has infinitely many solutions.
- For a system of inequalities, the solution is the region where the shaded areas overlap.

COMMON MISTAKES

- Stopping after finding x . The answer to a system is an ordered pair, so substitute back to find y .
- Multiplying only one side of an equation, or only some of its terms, before eliminating.

QUICK CHECK

5.1 Solve the system $y = 2x + 1$ and $3x + y = 11$.

5.2 Solve the system $x + y = 10$ and $x - y = 4$.

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

Exponents & exponential functions

MUST KNOW

- Exponent rules: $a^m \cdot a^n = a^{m+n}$, $\frac{a^m}{a^n} = a^{m-n}$ and $(a^m)^n = a^{mn}$.
- Zero and negative exponents: $a^0 = 1$ and $a^{-n} = \frac{1}{a^n}$ (for $a \neq 0$).
- An exponential function $y = a \cdot b^x$ shows growth when $b > 1$ and decay when $0 < b < 1$.
- Percent change: growth is $y = a(1 + r)^t$ and decay is $y = a(1 - r)^t$, with the rate r as a decimal.
- Linear patterns add the same amount each step; exponential patterns multiply by the same factor each step.

COMMON MISTAKES

- Forgetting to apply the outside exponent to the coefficient: $(2x^3)^2 = 4x^6$, not $2x^6$.
- Using the percent as the base. 5% growth means $b = 1.05$, not $b = 5$ or $b = 0.05$.

QUICK CHECK

6.1 Simplify $\frac{x^7 \cdot x^{-2}}{x^3}$.

6.2 A town of 2,000 people grows 3% per year. Write a model for the population P after t years.

6.3 Is $y = 50(0.8)^x$ growth or decay, and by what percent per step?

UNIT 7 · SEMESTER 2

Polynomials & factoring

MUST KNOW

- Add and subtract polynomials by combining like terms; to subtract, distribute the negative to every term first.
- Multiply binomials by distributing each term (FOIL): $(x + 3)(x - 5) = x^2 - 2x - 15$.
- Always factor out the greatest common factor first: $6x^2 + 9x = 3x(2x + 3)$.
- To factor $x^2 + bx + c$, find two numbers that multiply to c and add to b .
- Special patterns: $a^2 - b^2 = (a + b)(a - b)$ and $a^2 + 2ab + b^2 = (a + b)^2$.

COMMON MISTAKES

- Squaring a binomial term by term: $(x + 4)^2 = x^2 + 8x + 16$, not $x^2 + 16$.
- Skipping the GCF, which leaves the answer only partly factored.

QUICK CHECK

7.1 Multiply $(2x - 3)(x + 4)$.

7.2 Factor $x^2 - 7x + 12$.

7.3 Factor $4x^2 - 25$.

UNIT 8 · SEMESTER 2

Quadratic functions & equations

MUST KNOW

- In $y = ax^2 + bx + c$, the parabola opens up when $a > 0$ and down when $a < 0$.
- The vertex is on the axis of symmetry $x = -\frac{b}{2a}$; substitute that x to find the y -coordinate.
- Solve by factoring with the zero product property, by taking square roots, or with the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
- The discriminant $b^2 - 4ac$ tells you how many real solutions: positive gives two, zero gives one, negative gives none.
- Zeros, roots, solutions and x -intercepts all name the same points.

COMMON MISTAKES

- Factoring before the equation equals zero. Rewrite $x^2 + x = 6$ as $x^2 + x - 6 = 0$ first.
- Taking only the positive square root: $x^2 = 49$ gives $x = 7$ or $x = -7$.

QUICK CHECK

8.1 Solve $x^2 - 5x - 14 = 0$.

8.2 Find the vertex of $y = x^2 - 6x + 5$.

8.3 How many real solutions does $2x^2 + 3x + 5 = 0$ have?

Statistics & data

MUST KNOW

- The mean is the average and the median is the middle value; the median is less affected by outliers.
- Measures of spread: range, interquartile range ($IQR = Q_3 - Q_1$) and standard deviation.
- A box plot shows the five-number summary: minimum, Q_1 , median, Q_3 and maximum.
- Scatter plots show positive, negative or no correlation; the correlation coefficient r runs from -1 to 1 , and values near either end are strong.
- A line of best fit is for prediction, and correlation alone does not prove that one thing causes the other.

COMMON MISTAKES

- Finding the median without putting the data in order first.
- Calling $r = -0.9$ weak. The sign gives the direction; the distance from 0 gives the strength, so -0.9 is strong.

QUICK CHECK

9.1 Find the mean and median of 4, 8, 6, 5, 20. Which better describes a typical value?

9.2 A box plot has $Q_1 = 12$ and $Q_3 = 30$. What is the interquartile range?

9.3 The line of best fit for test score y and hours studied x is $y = 2.5x + 40$. Predict the score for 6 hours.

Answer key

Unit 1: Signed numbers & expressions

1.1 11. $-4 + 9 = 5$, and subtracting -6 is the same as adding 6.

1.2 $2x - 15$. Distribute to get $6x - 15 - 4x$, then combine $6x - 4x$.

1.3 21. $2(-3)^2 - (-3) = 2(9) + 3 = 21$.

Unit 2: Linear equations & formulas

2.1 $x = 8$. Subtract $2x$ to get $2x - 7 = 9$, add 7 to get $2x = 16$.

2.2 $x = 12$. Subtract 2 to get $\frac{x}{3} = 4$, then multiply by 3.

2.3 $w = \frac{P-2l}{2}$. Subtract $2l$ from both sides, then divide by 2.

Unit 3: Linear inequalities

3.1 $x \leq -3$. Subtract 5 to get $-2x \geq 6$, then divide by -2 and flip the sign.

3.2 $-2 < x \leq 3$. Subtract 3 from all three parts, then divide all three by 2.

3.3 $-3 \leq x \leq 7$. Rewrite as $-5 \leq x - 2 \leq 5$ and add 2 to each part.

Unit 4: Functions & linear models

4.1 -10 . $3(-2) - 4 = -6 - 4$.

4.2 -2 . $\frac{-1-5}{4-1} = \frac{-6}{3}$.

4.3 $y = 3x - 5$. Start from $y - 1 = 3(x - 2)$, distribute, then add 1.

Unit 5: Systems of equations

5.1 $(2, 5)$. Substitute: $3x + 2x + 1 = 11$, so $x = 2$ and $y = 2(2) + 1 = 5$.

5.2 $(7, 3)$. Adding the equations gives $2x = 14$, so $x = 7$, then $y = 3$.

5.3 None. The lines have the same slope and different y -intercepts, so they are parallel.

Unit 6: Exponents & exponential functions

6.1 x^2 . The top is $x^{7+(-2)} = x^5$, and $\frac{x^5}{x^3} = x^2$.

6.2 $P = 2000(1.03)^t$. Growth of 3% multiplies by $1 + 0.03$ each year.

6.3 Decay of 20% per step, because $0.8 = 1 - 0.2$.

Unit 7: Polynomials & factoring

7.1 $2x^2 + 5x - 12$. $2x^2 + 8x - 3x - 12$, then combine $8x - 3x$.

7.2 $(x - 3)(x - 4)$. -3 and -4 multiply to 12 and add to -7 .

7.3 $(2x + 5)(2x - 5)$. It is a difference of squares: $(2x)^2 - 5^2$.

Unit 8: Quadratic functions & equations

8.1 $x = 7$ or $x = -2$. It factors as $(x - 7)(x + 2) = 0$.

8.2 $(3, -4)$. $x = -\frac{-6}{2(1)} = 3$, and $3^2 - 6(3) + 5 = -4$.

8.3 None. The discriminant is $3^2 - 4(2)(5) = -31$, which is negative.

Unit 9: Statistics & data

9.1 Mean 8.6, median 6. The median is better here because the outlier 20 pulls the mean up.

9.2 18. $IQR = Q_3 - Q_1 = 30 - 12$.

9.3 55. $2.5(6) + 40 = 55$; the slope means about 2.5 more points per extra hour.