Grade 9 Math Cheat Sheet

Solve an equation

Distribute	$2(3x - 1) + 4 = 20$
Collect and subtract	$6x + 2 = 20 \rightarrow 6x = 18$
Divide by 6	$x = 3$

Keep both sides balanced. When multiplying or dividing an inequality by a negative, reverse its sign.

Evaluate a function

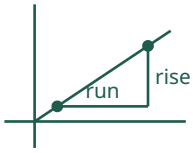
Function rule	$f(x) = 3x - 2$
Substitute 4 for x	$f(4) = 3(4) - 2$
Output	$f(4) = 10$

The domain lists allowed inputs. The range lists the outputs they produce.

Lines and slope

Slope-intercept	$y = mx + b$
Direct variation	$y = kx$
Slope	$m = (y_2 - y_1) / (x_2 - x_1)$

m is slope; b is the y-intercept.
k is the constant of proportionality.
Matching x-values give undefined slope.



Linear equations and systems

Slope-intercept	$y = mx + b$
Point-slope	$y - y_1 = m(x - x_1)$
Example intersection	$y = 2x + 1; y = x + 4$

For the example, set the expressions equal: x = 3 and y = 7.
A solution must work in both equations.

Factor to find the zeros

Start with zero on one side	$x^2 - 7x + 12 = 0$
Factor	$(x - 3)(x - 4) = 0$
Set each factor to zero	$x = 3$ or $x = 4$

The zeros are the x-intercepts of the corresponding quadratic graph.

Quadratic equations

Standard form	$ax^2 + bx + c = 0$
Discriminant	$D = b^2 - 4ac$
Quadratic formula	$x = (-b \pm \text{sqrt}(D)) / (2a)$
Axis of symmetry	$x = -b/(2a)$

a is nonzero. For real coefficients, D < 0 means no real roots. sqrt(D) means square root.

Read a quadratic graph

Vertex form	$y = a(x - h)^2 + k$
Vertex and symmetry line	$(h, k), x = h$
Factored form	$y = a(x - r)(x - s)$

Use a nonzero a. Real factors give x-intercepts at r and s; the parabola opens upward when a is positive.

Exponential models

General form	$y = a \times b^t$
Growth	$b = 1 + r$
Decay	$b = 1 - r$
Example: 10% growth	$y = 40 \times 1.1^t$

a is the initial value, t counts equal periods, and r is a per-period rate as a decimal. Use 0 < r < 1 for decay.