Essential Math Formula Sheet

Three forms of a line

Slope-intercept	$y = mx + b$
Point-slope	$y - y_1 = m(x - x_1)$
Standard	$Ax + By = C$

Read m and b in slope-intercept form. Use point-slope when a point and slope are given.
A and B are not both zero. A vertical line cannot be written as y = mx + b.

Find and count roots

Discriminant	$D = b^2 - 4ac$
Roots when D is nonnegative	$x = (-b \pm \sqrt{(D)})/(2a)$
Sum of roots	$r_1 + r_2 = -b/a$
Product of roots	$r_1\, r_2 = c/a$

For real coefficients, D > 0 gives two real roots, D = 0 one repeated root, D < 0 no real roots.

Multiply or divide powers

Same base, multiply	$a^m\, a^n = a^{m+n}$
Same base, divide	$a^m/a^n = a^{m-n}$
Power of a power	$(a^m)^n = a^{mn}$
Power of a product	$(ab)^n = a^n\, b^n$

For these integer-exponent rules, assume nonzero bases. Add exponents only in a same-base product.

Fractional powers & roots

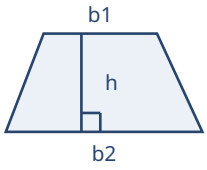
Square root	$a^{1/2} = \sqrt{(a)}$
General positive base	$a^{m/n} = (a^{1/n})^m$
Example	$27^{2/3} = 3^2 = 9$
Square root of a square	$\sqrt{(x^2)} = \lvert x \rvert$

For the general rule use a > 0 and positive integer n. An even real root cannot have a negative radicand.

Area of plane figures

Triangle	$A = \frac{1}{2}bh$
Rectangle or parallelogram	$A = bh$
Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$

Measure h perpendicular to the base.
The trapezoid bases are parallel.
Use square units.



Volume

Prism or cylinder	$V = Bh$
Pyramid or cone	$V = Bh / 3$
Sphere	$V = (4/3)\pi r^3$

B is the area of one base. h is perpendicular height.
Use cubic units.

Counting and arrangements

Successive choices	**multiply available counts**
Order matters	$P(n,k) = n!/(n - k)!$
Order does not matter	$C(n,k) = n!/[k!(n - k)!]$

The formulas select k distinct objects from n, with 0 <= k <= n. Use 0! = 1.

Interest and present value

Simple total	$A = P(1 + rt)$
Compound m times per year	$A = P(1 + r/m)^{mt}$
Continuous compounding	$A = Pe^{rt}$
Discount a future value	$P = A/(1 + r/m)^{mt}$

Use decimal annual rate r and time in years t. P is principal; A is total value.