



SAT MATH SHORT

A math guide by a perfect scorer.

WHAT IS INSIDE

1

Formulas only

no explaining, just the maths

6 PAGES

2

Desmos lines

kept beside the formulas

INCLUDED

3

Full unit circle

radians, degrees, exact values

1 PAGE

4

Prints on three sheets

double sided

A4

Never think twice before investing in yourself.

Method, not more content.

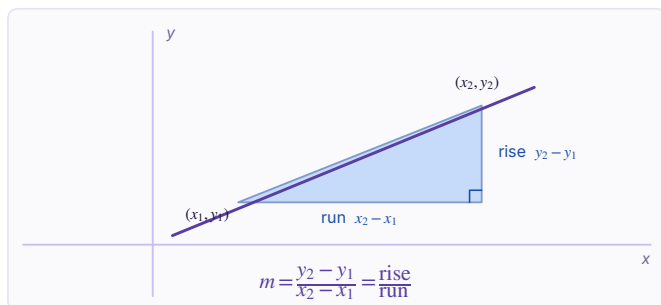
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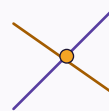
Edition 2.0 · August 2026



Algebra



One solution



lines cross once
 $a_1/a_2 \neq b_1/b_2$

No solution



parallel, different c
 $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Infinitely many



same line twice
 $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

The three forms of a line

$$y = mx + b$$

$$y - y_1 = m(x - x_1)$$

$$Ax + By = C$$

slope is $-A/B$

Parallel and perpendicular

$$m_1 = m_2$$

$$m_1 m_2 = -1$$

flip it and change the sign

Distance and midpoint

$$d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$$

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Absolute value

$$|x| < a \Rightarrow -a < x < a$$

one range

$$|x| > a \Rightarrow x < -a \text{ or } x > a$$

two pieces

Inequalities

$\times$ or $\div$ by a negative, flip the sign

In Desmos: type it exactly as written and Desmos shades the right region.

NOTE How many solutions a system has

Put both equations into $y = mx + b$ and look at them.

Different slope, they cross once, one solution.

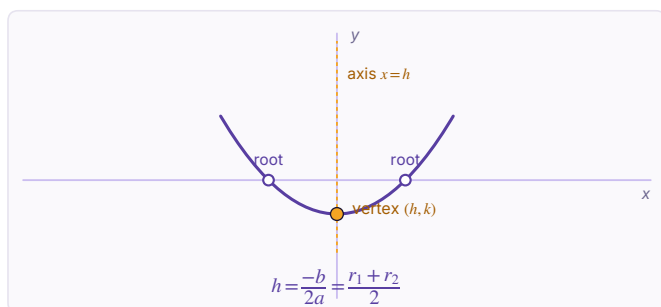
Same slope, different intercept, parallel, no solution.

Same slope, same intercept, it is one line written twice, infinitely many.

SHORTCUT Once that feels automatic

With both in $ax + by = c$ you can compare directly. a_1/a_2 not equal to b_1/b_2 is one solution. All three equal is infinitely many. First two equal but not the third is no solution.

Advanced Math



Three forms of a quadratic

$$y = ax^2 + bx + c$$

c is the y-intercept

$$y = a(x - h)^2 + k$$

vertex is (h, k)

$$y = a(x - r_1)(x - r_2)$$

roots



Quadratic formula and root count

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$b^2 - 4ac$$

+ two, 0 one, - none

In Desmos: type it with = 0 and click the marked points on the x-axis.

Sum and product of the solutions

SHORTCUT

$$r_1 + r_2 = -\frac{b}{a}$$

$$r_1 r_2 = \frac{c}{a}$$

Divide by a, not by 1.

Vertex

SHORTCUT

$$x = \frac{-b}{2a}$$

also halfway between the roots

Exponents

$$x^a x^b = x^{a+b} \quad \frac{x^a}{x^b} = x^{a-b}$$

$$(x^a)^b = x^{ab} \quad x^{-a} = \frac{1}{x^a}$$

$$x^{a/b} = \sqrt[b]{x^a} \quad x^0 = 1$$

Factoring

$$a^2 - b^2 = (a + b)(a - b)$$

$$a^2 \pm 2ab + b^2 = (a \pm b)^2$$

Moving a graph

$$f(x) + k$$

up

$$f(x + h)$$

LEFT, the opposite of how it looks

$$-f(x)$$

flips top to bottom

$$f(-x)$$

flips left to right

Growth, decay, interest

$$y = a(1 \pm r)^t$$

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

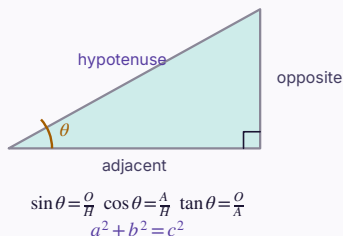
power is n times t

$$y = a \left(\frac{1}{2} \right)^{t/h}$$

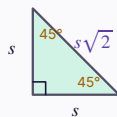
half life

Geometry and Trigonometry

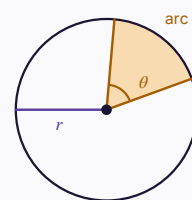
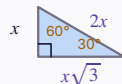
SOH · CAH · TOA



45-45-90



30-60-90



$$\text{arc} = 2\pi r \cdot \frac{\theta}{360} \quad \text{sector} = \pi r^2 \cdot \frac{\theta}{360}$$

$$(x-h)^2 + (y-k)^2 = r^2$$

Angles

SHORTCUT

triangle = 180° polygon = $(n-2)180^\circ$

outside angles always add to 360°

exterior = the two far angles

Similar shapes

SHORTCUT

sides $\times k$

area $\times k^2$ volume $\times k^3$

Circle equation

$$(x-h)^2 + (y-k)^2 = r^2$$

complete the square to get here

In Desmos: type it and Desmos draws the circle.

Arc, sector, radians

SHORTCUT

$$\frac{\theta}{360} = \frac{\text{arc}}{C} = \frac{\text{sector}}{A}$$

$$180^\circ = \pi$$

Surface area, never printed

$$\text{cylinder} = 2\pi r^2 + 2\pi rh$$

$$\text{sphere} = 4\pi r^2$$

$$\text{box} = 2(\ell w + \ell h + wh)$$

Trigonometry

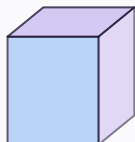
SHORTCUT

$$\sin = \frac{O}{H} \quad \cos = \frac{A}{H} \quad \tan = \frac{O}{A}$$

$$\sin x = \cos(90^\circ - x)$$

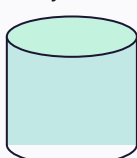
the one worth memorising
 $\sin^2 \theta + \cos^2 \theta = 1$

Prism



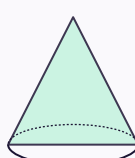
$$V = \ell wh$$

Cylinder



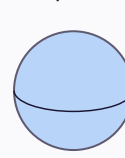
$$V = \pi r^2 h$$

Cone



$$V = \frac{1}{3}\pi r^2 h$$

Sphere



$$V = \frac{4}{3}\pi r^3$$

Problem Solving and Data

Percent

SHORTCUT

$$\frac{\text{new} - \text{old}}{\text{old}} \times 100$$

$$+15\% \Rightarrow \times 1.15 \quad -15\% \Rightarrow \times 0.85$$

$$\text{old} = \frac{\text{new}}{1.15}$$

working backwards

Rates and proportions

$$\frac{a}{b} = \frac{c}{d} \Rightarrow ad = bc$$

$$d = rt$$

$$\frac{1}{t} = \frac{1}{a} + \frac{1}{b}$$

working together

Averages

SHORTCUT

$$\text{total} = \text{mean} \times \text{how many}$$

Work in totals when a value is added or taken away.

In Desmos: put the numbers in a table, then type mean(L1) or median(L1).

Spread

$$\text{range} = \text{max} - \text{min}$$

$$\text{IQR} = Q_3 - Q_1$$

SD is spread, not centre

Probability

$$P = \frac{\text{the ones you want}}{\text{the total}}$$

$$P(\text{at least one}) = 1 - P(\text{none})$$

'Given that' means a row or column total, not the grand total.

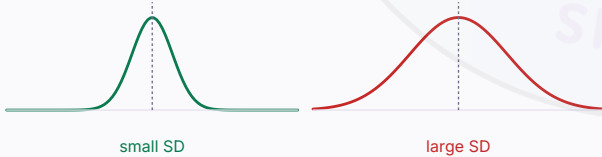
Line of best fit

$$\hat{y} = mx + b$$

$$\text{residual} = \text{actual} - \text{predicted}$$

In Desmos: table, then type $y1 \sim mx1 + b$.

Same mean, different spread
SD measures spread, never centre



Box plot anatomy



$$\text{IQR} = Q_3 - Q_1$$

What changes	Mean	Median	Range	SD
Add the same number to everything	goes up	goes up	no change	no change
Multiply everything by k	times k	times k	times k	times k
Add one very large value	moves a lot	barely moves	grows	grows
Data gets more bunched up	same	same	shrinks	shrinks

The unit circle



Radians inside · degrees and exact coordinates outside · A S T C = which ratio is positive

angle	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undefined



Desmos and the mistakes list

Desmos

What you want	What you type
Solve any equation	each side as y1 and y2, click where they cross
Solve a system	both equations, click the crossing point
Roots, vertex, intercepts	click the grey dots Desmos marks for you
Find the value of a letter	type k, press add slider, drag it
Mean, median, SD	table, then mean(L1), median(L1), stdev(L1)
Line of best fit	$y1 \sim mx1 + b$
Limit the graph to a range	$y = 2x + 1 \{0 < x < 5\}$
Shade an inequality	type it exactly as written

NOTE Two things to practise before test day

The keys: ^ for powers, / for fractions, sqrt for roots, right arrow to get out.
Zoom out first. Deciding there is no solution when the window is too small is the most common Desmos mistake.

Where marks actually go

- You solved for x, they asked for $x + y$.
- '30 percent of' is 0.3B, '30 percent more than' is 1.3B, '30 percent less than' is 0.7B.
- Given the diameter, needed the radius. Write $r =$ something first.
- Forgot to flip the inequality after dividing by a negative.
- Squared both sides and never checked the answers still work.
- Sum of the solutions is $-b$ over a , not $-b$.
- Units left as they were. Minutes against hours, cm against m.
- Took the median off a list that was not sorted.
- Used the grand total when the question said 'given that'.
- Read a link between two things as one causing the other.
- $f(x + 3)$ moves the graph LEFT, not right.
- Compound interest power is n times t , not t .