



The night before

Two pages. Only the things the test does not print for you. Read it the night before, not the week before.

Lines

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

$$y = mx + b$$

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

$$Ax + By = C \Rightarrow m = -\frac{A}{B}$$

$$m_1 = m_2 \text{ parallel} \quad m_1 m_2 = -1 \text{ perp}$$

How many solutions

different slope

one

same slope, different intercept

none

same slope, same intercept

infinitely many

Put both into $y = mx + b$ and look. That is the whole method.

Quadratics

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

$$b^2 - 4ac$$

+ two roots, 0 one, - none

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

vertex (h, k)

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

vertex x

Sum and product of the solutions

SHORTCUT

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

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

Divide by a. This is the fastest mark on the paper.

Exponents and roots

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

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

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

Factoring on sight

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

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

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

Percent

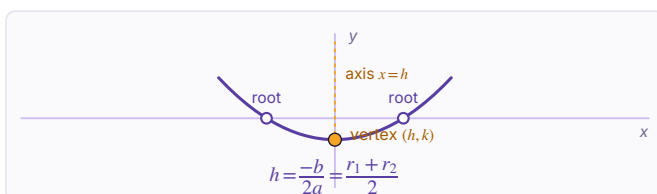
SHORTCUT

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

$$+p\% \Rightarrow \times(1 + p) \quad -p\% \Rightarrow \times(1 - p)$$

$$\text{old} = \frac{\text{new}}{1 + p}$$

backwards



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



Geometry, data, Desmos and the mistakes

Angles

triangle = 180°

$(n-2) \times 180^\circ$

polygon inside
 360°

polygon outside, always
exterior = the two far angles

Similar shapes

SHORTCUT

sides $\times k$

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

Circles

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

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

$$180^\circ = \pi$$

$$\text{inscribed} = \frac{1}{2} \text{ central}$$

Surface area, never printed

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

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

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

$$\text{cube} = 6s^2$$

Trigonometry

SHORTCUT

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

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

turns a whole question into one line
 $\sin^2 \theta + \cos^2 \theta = 1$

Data

total = mean $\times$ how many

work in totals
 $\text{IQR} = Q_3 - Q_1$

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

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

Desmos, the five that matter

- Any equation: each side as y1 and y2, click where they cross
- A system: type both, click the crossing point
- Roots and vertex: click the grey dots Desmos already marks
- A letter in the question: type k, press add slider, drag it
- Stats: put the data in a table, then mean(L1), median(L1), stdev(L1)

The twelve that cost marks

- ✗ Solved for x, they wanted $x + y$
- ✗ 'of' is 0.3B, 'more than' is 1.3B, 'less than' is 0.7B
- ✗ Given the diameter, needed the radius
- ✗ Did not flip the inequality after a negative
- ✗ Squared both sides and never checked
- ✗ Sum of the solutions is -b over a, not -b
- ✗ Units left as they were
- ✗ Median off an unsorted list
- ✗ Grand total used after 'given that'
- ✗ Read a link as a cause
- ✗ $f(x + 3)$ moves it LEFT, not right
- ✗ Compound interest power is n times t