

Paper SAT May 2023

No-Calculator Math (Section 3)

The 20 skills that ran the retired paper SAT —
taught with 20 original SOMATH problems, built for the Digital SAT.

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How to use this deck

- One retired paper SAT, one skill at a time. Twenty skills total.
- Every practice problem is written by SOMATH — no reprints of College Board content.
- The retired paper SAT is copyrighted. The current Digital SAT tests the same core skills.
- Grab the free printable worksheet at schoolofmath.us/posts/paper-sat-may-2023-no-calculator-math-20-original-problems
- Book a free Digital SAT evaluation at schoolofmath.us/evaluation — or come see us on the UWS.

Skill by skill

SKILL 1 OF 20

Read a scatterplot

Read a specific point directly — don't over-solve.

ORIGINAL SOMATH PROBLEM

A quiz has 3-pt and 5-pt questions totaling 60 pts. Valid combos plotted: (0,12), (5,9), (10,6), (15,3), (20,0). With exactly 5 three-pt questions, how many 5-pt?

Answer: 9 (choice C). Read y at $x = 5$.

SKILL 2 OF 20

Linear function from two points

slope = $\Delta y / \Delta x$, y-intercept = $f(0)$.

ORIGINAL SOMATH PROBLEM

g is linear, passes through (0, -2) and (1, 1). Find g(x).

Answer: $g(x) = 3x - 2$.

Skill by skill

SKILL 3 OF 20

x-intercept means $f(a) = 0$

That's the whole translation. Memorize it.

ORIGINAL SOMATH PROBLEM

h has x-intercepts $(-4, 0)$ and $(7, 0)$. Which **MUST** be true?

Answer: $h(-4) = 0$.

SKILL 4 OF 20

Solve a linear system

When one variable is isolated, just substitute.

ORIGINAL SOMATH PROBLEM

y = $2x + 5$ and $3x - y = 4$.

Answer: $x = 9, y = 23 \rightarrow (9, 23)$.

Skill by skill

SKILL 5 OF 20

$$|E| = 0$$

One solution: the inside is exactly 0. Don't split into cases.

ORIGINAL SOMATH PROBLEM

Solve $|x + 7| = 0$.

Answer: $x = -7$ only.

SKILL 6 OF 20

Rearrange a formula with a square

Divide first, then take the branch that matches the domain.

ORIGINAL SOMATH PROBLEM

$p = t(w - 3)^2$, $w > 3$. Solve for w .

Answer: $w = 3 + \sqrt{(p/t)}$.

Skill by skill

SKILL 7 OF 20

Linear equation from words

"decreases by 4 per unit" = slope -4 . "at $x = 0$, $y = 9$ " = intercept 9.

ORIGINAL SOMATH PROBLEM

Each $+1$ in x drops y by 4. At $x = 0$, $y = 9$. Find the equation.

Answer: $y = -4x + 9$.

SKILL 8 OF 20

Factored-form parabola $\rightarrow$ vertex

Axis of symmetry sits halfway between the roots.

ORIGINAL SOMATH PROBLEM

$y = -x(x - 10)/k$ opens down, roots 0 and 10, max height 25. Find k .

Answer: Vertex at $x = 5$: $25/k = 25 \rightarrow k = 1$.

Skill by skill

SKILL 9 OF 20

45-45-90 triangle

Sides in ratio $1 : 1 : \sqrt{2}$.

ORIGINAL SOMATH PROBLEM

Isosceles right triangle, hypotenuse 6. Perimeter?

Answer: Each leg = $3\sqrt{2}$. Perimeter = $6 + 6\sqrt{2}$.

SKILL 10 OF 20

How many solutions

Simplify both sides. Contradiction $\rightarrow$ zero. Identity $\rightarrow$ infinite.

ORIGINAL SOMATH PROBLEM

$5(x - 3) = 2x + 3(x - 4)$

Answer: $5x - 15 = 5x - 12 \rightarrow$ zero solutions.

Skill by skill

SKILL 11 OF 20

Tangent line at a point

Radius tangent. Tangent slope = – reciprocal of radius slope.

ORIGINAL SOMATH PROBLEM

Circle center (4, 3), tangent at (7, 7). Slope of the tangent?

Answer: Radius slope $\frac{4}{3} \rightarrow$ tangent slope $-\frac{3}{4}$.

SKILL 12 OF 20

Function input in context

Match the definition literally. "After 0 weeks" = $P(0)$.

ORIGINAL SOMATH PROBLEM

$P(n) = 500 - 120(1.6)^{-0.2n}$ after n weeks. Value at 0 weeks?

Answer: $P(0)$.

Skill by skill

SKILL 13 OF 20

Decay by 25% per step

"Drops 25%" = multiply by 0.75 each step.

ORIGINAL SOMATH PROBLEM

80 s on trial 1, drops 25% each trial. Trial 4?

Answer: $80 \cdot (0.75)^3 = 33.75 \approx 34$ s.

SKILL 14 OF 20

Test rows against two inequalities

A row is valid only if BOTH inequalities hold.

ORIGINAL SOMATH PROBLEM

Find the table where every row satisfies $y < (1/3)x + 2$ AND $y > (1/2)x - 4$.

Answer: Choice D: $(-3, -2)$, $(0, 0)$, $(6, 0)$ — all three rows pass both.

Skill by skill

SKILL 15 OF 20

Simplify a radical product

Simplify each radical first, then multiply integers.

ORIGINAL SOMATH PROBLEM

$\sqrt{50} \cdot (\text{cube root of } 8)$.

Answer: $\sqrt{50} = 5\sqrt{2}$; cube root of $8 = 2 \rightarrow 10\sqrt{2}$.

SKILL 16 OF 20

Parallel lines have equal slopes

Compute the given slope; that's your answer.

ORIGINAL SOMATH PROBLEM

Line k through $(0, 1)$ and $(6, 3)$. Slope of a parallel line j ?

Answer: $1/3$.

Skill by skill

SKILL 17 OF 20

Divide monomials

Divide coefficients, subtract exponents.

ORIGINAL SOMATH PROBLEM

$45x^8 / (9x^2) = c \cdot x^d$. Find $c + d$.

Answer: $5x^6 \rightarrow c + d = 11$.

SKILL 18 OF 20

Linear equation with decimals

Distribute, then isolate. Decimals aren't harder.

ORIGINAL SOMATH PROBLEM

$3.4(h + 2) = 4.4h + 3.4$. Find h .

Answer: $3.4h + 6.8 = 4.4h + 3.4 \rightarrow h = 3.4$.

Skill by skill

SKILL 19 OF 20

Cylinder vs sphere volumes

Cylinder $\pi r^2 h$ vs sphere $(4/3)\pi r^3$. Cancel π .

ORIGINAL SOMATH PROBLEM

Same r . Cylinder height 12. Sphere = $(1/3)$ cylinder. Find r .

Answer: $(4/3)r = 4 \rightarrow r = 3$.

SKILL 20 OF 20

Sum and product of roots

The two branches of the quadratic formula are the two roots.

ORIGINAL SOMATH PROBLEM

$-b + \sqrt{\text{disc}} = 14$ and $-b - \sqrt{\text{disc}} = -2$. Solutions?

Answer: Roots 7 and -1 .

Bridge to the Digital SAT

- The Digital SAT dropped the No-Calc section — but every one of these 20 skills is still tested (on-calc now).
- Scoring is adaptive: Module 1 places you, Module 2 sets your ceiling. Miss easy skills early and Module 2 caps low.
- Length changed (98 → 44 math questions). Pacing pressure and topic coverage did not.
- Use these 20 problems as a diagnostic. If more than 3 feel slow, that's the shortlist for your Digital SAT prep.
- Next steps: schoolofmath.us/posts/digital-sat-tutoring-nyc-2026-structure-dates-scores · schoolofmath.us/courses/digital-sat

Book a free 30-minute SAT evaluation.

We'll test the 20 skills above and any Digital SAT gaps.
You leave with a written prep plan — no obligation.

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