BLUEBOOK · PRACTICE TEST 4 · MATH

Practice Test 4's hardest math. All solved.

The questions from my full walkthrough video that slow people down the most. Every one worked out step by step in plain words, with the Desmos moves I use and **the trap** each one is built to catch you with.

HOW TO USE IT

Try each question **before** you scroll to my working. Getting it wrong first is what makes it stick.

A NOTE BEFORE YOU START

If a question in the video lost you, this is where you slow down and get it. No speedrun, no “this one’s obvious”. Every step is written the way I’d explain it to my own student sitting right next to me.

Redo them the week before your test. If you can get these, the rest of the test feels easy.

Tan

ON EVERY QUESTION

The real question
Exactly as it was on the test. Try it on paper first.

My full working
One step at a time, plus the Desmos screen where I use it.

The trap
The wrong answer built to catch you, so it can’t catch you twice.

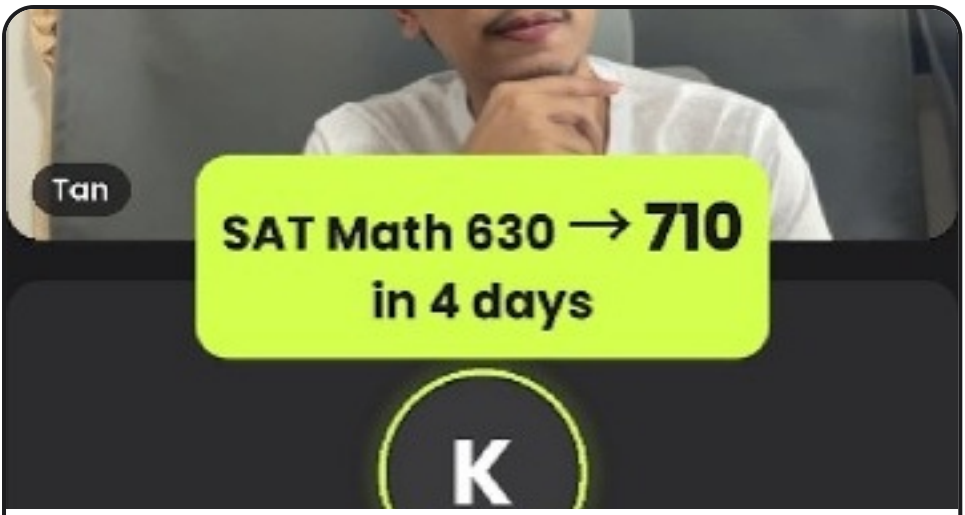


Hi, I'm Tan

In grade 4 I needed extra math every day. Then I got an 800.

In grade 4, I was so weak at math that my teacher kept me after school for extra lessons, **every single day**. That kid later taught himself to an SAT Math 800, and has spent the last two years tutoring students 1-on-1, from "what is 2 minus 5?" to 750s.

So **I get it**. Wherever math broke for you, we go back there and build up, **at your pace**.



630 → 710 in 4 days

"I never would've been able to do it without you."

Watch Keertana's testimonial →

A FEW STUDENTS WHO PUT THIS TO WORK

Shared with permission. Every score and quote below is real.

630 → 710

Keertana

“I just checked my score and hit 710 in math.” Four days of lessons before her test.

580 → 750

Mossy

“Thank you so much for teaching me so well, bro.” Stuck at 580–620 for months after a big-name prep course.

650 → 710

Alisa

“Hit my target, 710! You teach SO well.” Two weeks after we started.

01

MODULE 1 · Q21 · GEOMETRY AND TRIGONOMETRY

Similar triangles, then tan

$$RS = 20$$
$$ST = 48$$
$$TR = 52$$

The side lengths of right triangle RST are given. Triangle RST is similar to triangle UVW, where S corresponds to V and T corresponds to W. What is the value of $\tan W$?

A $\frac{5}{13}$

B $\frac{5}{12}$

C $\frac{12}{13}$

D $\frac{12}{5}$

Try it first. *My working is on the next page.*

MY WORKING · 1 OF 2

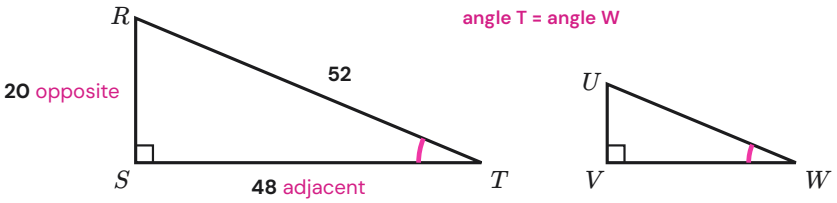
01 Similar triangles, then tan

THE KEY IDEA

The **hypotenuse is always the longest side**. And similar triangles have the **same angles**, so $\tan W$ is just $\tan T$.

1. Sketch it. The question never says which side is the hypotenuse, but the longest side always is. $TR = 52$ is the longest, so TR is the hypotenuse, and the right angle sits at the missing letter, S.

2. Now draw UVW, a smaller copy. S goes to V, so V is the right angle. T goes to W. That leaves U where R was. Similar means same shape, so **angle W equals angle T**.



My working continues on the next page ↓

01

MY WORKING · 2 OF 2

Similar triangles, then tan

3 So $\tan W = \tan T$. SOH CAH TOA: tan is opposite over adjacent. Standing at angle T, the opposite side is $RS = 20$ and the adjacent side is $ST = 48$. Simplify by 4.

$$\tan W = \tan T = \frac{20}{48} = \frac{5}{12}$$

THE TRAP

D, $\frac{12}{5}$. That's adjacent over opposite, the tan of the **other** angle. Always check which angle you're standing at.

ANSWER **B.** $\frac{5}{12}$

02

MODULE 1 · Q22 · ALGEBRA

Shift the line, find the x-intercept

The graph of $9x - 10y = 19$ is translated down 4 units in the xy-plane. What is the x-coordinate of the x-intercept of the resulting graph?

Grid-in: you type the answer, there are no choices.

Try it first. *My working is on the next page.*

02

MY WORKING · 1 OF 2

Shift the line, find the x-intercept

THE KEY IDEA

To move a graph, make it a **function of** x first. Then $f(x) - 4$ moves it **down 4 units**.

1. Get y on its own. Move the $10y$ to the right, then the 19 to the left, then divide both sides by 10.

$$9x - 19 = 10y$$

$$y = \frac{9x - 19}{10}$$

2. Call it $f(x)$ and type it into Desmos. Double-check it by typing the original equation too. The two lines should sit right on top of each other. (I had a 9 instead of a 19 on my first try. This check caught it.)

$$f(x) = \frac{9x - 19}{10}$$

3. Subtract 4 to move it down. Click where the new line crosses the x-axis.

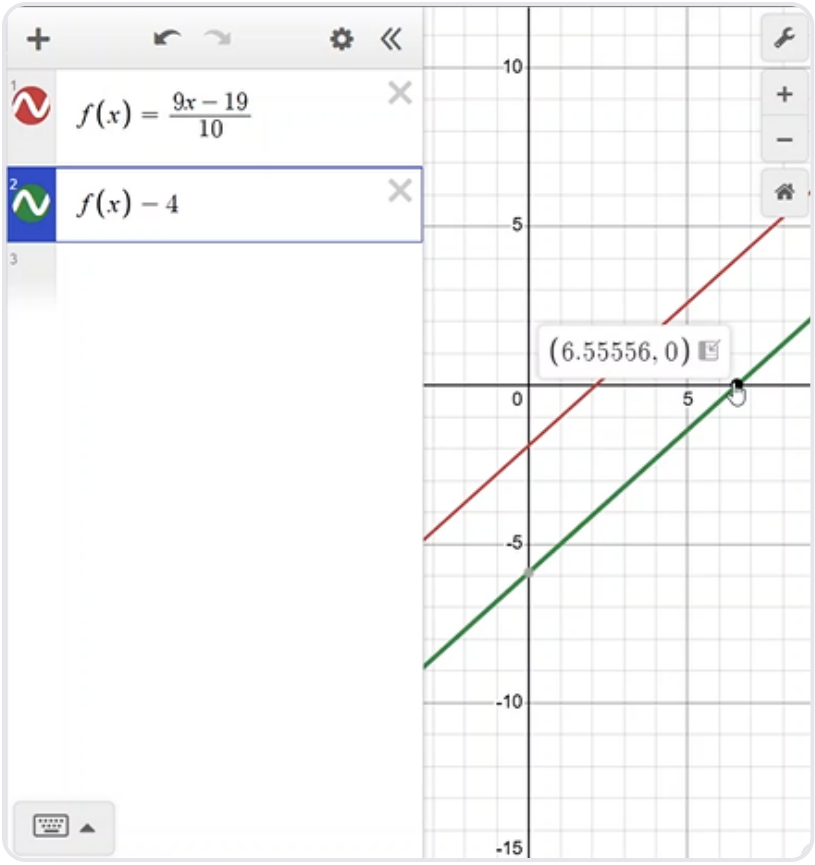
$$f(x) - 4 \quad \Rightarrow \quad x = 6.5556$$

My working continues on the next page ↓

02

MY WORKING · 2 OF 2

Shift the line, find the x-intercept



FROM THE VIDEO Red is the original line. Green is $f(x) - 4$. The green one crosses the x-axis at 6.5556.

THE TRAP

Reading the **red** line. That's the graph before the move. The question wants the green one.

ANSWER $\frac{59}{9}$ **(or 6.555, 6.556)**

03

MODULE 2 · Q10 · ADVANCED MATH

Growth every 18 months

$$P(t) = 290(1.04)^{\left(\frac{4}{6}\right)t}$$

The function P models the population, in thousands, of a certain city t years after 2005. According to the model, the population is predicted to increase by $n\%$ every 18 months. What is the value of n?

A 0.38

B 1.04

C 4

D 6

Try it first. *My working is on the next page.*

03

MY WORKING · 1 OF 2

Growth every 18 months

THE KEY IDEA

t is in **years**, so 18 months has to become years first: $18 \div 12 = 1.5$.

1. Type $P(t)$ into Desmos so it knows what the function looks like.

$$P(t) = 290(1.04)^{\frac{4}{6}t}$$

2. Find the population now and after 18 months, which is 1.5 years.

$$P(0) = 290$$

$$P(1.5) = 301.6$$

3. How many percent did it grow? Percent change is new minus old, over old, times 100.

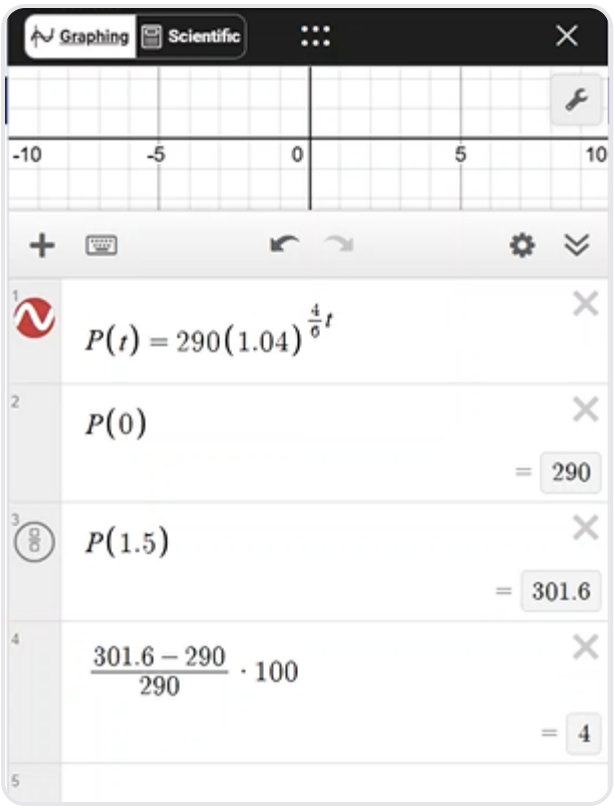
$$\frac{301.6 - 290}{290} \times 100 = 4$$

My working continues on the next page ↓

03

MY WORKING · 2 OF 2

Growth every 18 months



FROM THE VIDEO $P(0)$, then $P(1.5)$, then the percent change: 4.

THE TRAP

B, 1.04. That's the growth **factor**, not the percent. And if you plug in $t = 18$, you're testing 18 **years**.

ANSWER **C. 4**

04

MODULE 2 · Q13 · ADVANCED MATH

When does it have no real solutions?

$$x^2 - 34x + c = 0$$

In the given equation, c is a constant. The equation has no real solutions if $c > n$. What is the least possible value of n?

Grid-in: you type the answer, there are no choices.

Try it first. *My working is on the next page.*

04

MY WORKING · 1 OF 2

When does it have no real solutions?

THE KEY IDEA

Quadratic + **number of solutions** = discriminant.
No real solutions means $b^2 - 4ac < 0$.

1. Read off a, b and c. b is the number next to x, so $b = -34$. $a = 1$, and c is just c.

$$(-34)^2 - 4(1)(c) < 0$$

2. Solve it in Desmos. Desmos wants x, so change c to x. You get a shaded graph instead of a number, so read the graph.

$$(-34)^2 - 4(1)(x) < 0$$

3. The shading starts at 289 and goes right, so $x > 289$. But x was really c, so $c > 289$. The question says $c > n$, so n is 289.

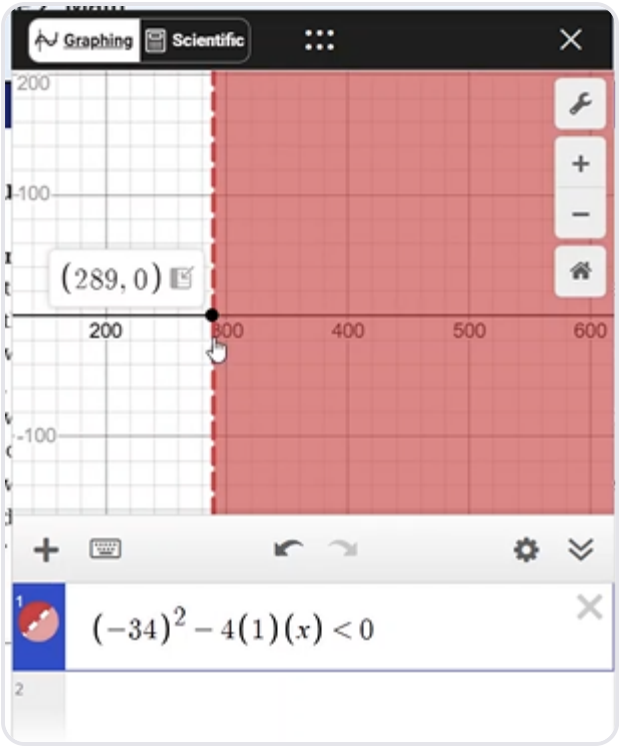
$$c > 289 \quad \Rightarrow \quad n = 289$$

My working continues on the next page ↓

04

MY WORKING · 2 OF 2

When does it have no real solutions?



FROM THE VIDEO Shaded from 289 to the right: $x > 289$, so $c > 289$.

THE TRAP

Forgetting that x in Desmos is really c. And it's $c > 289$, not $\geq$: at exactly 289 there's one solution.

ANSWER **289**

05

MODULE 2 · Q14 · PROBLEM-SOLVING AND DATA ANALYSIS

Mean of two data sets combined

Data set A consists of the heights of 75 buildings and has a mean of 32 meters. Data set B consists of the heights of 50 buildings and has a mean of 62 meters. Data set C consists of the heights of the 125 buildings from data sets A and B. What is the mean, in meters, of data set C?

Grid-in: you type the answer, there are no choices.

Try it first. *My working is on the next page.*

05

MY WORKING · 1 OF 2

Mean of two data sets combined

THE KEY IDEA

You can't find each building's height, but you don't need to. **Mean = sum ÷ count**, so **sum = mean × count**.

1. Data set C is A and B thrown together. That's why it has $75 + 50 = 125$ buildings. Its mean is the total height of all 125, divided by 125.

$$\text{mean of C} = \frac{\text{sum of A} + \text{sum of B}}{125}$$

2. Sum of A. Use the formula backwards: the mean is 32 and there are 75 buildings.

$$\text{sum of A} = 32 \times 75 = 2400$$

3. Same thing for B.

$$\text{sum of B} = 62 \times 50 = 3100$$

4. Add the sums and divide by 125.

$$\frac{2400 + 3100}{125} = \frac{5500}{125} = 44$$

My working continues on the next page ↓

05

MY WORKING · 2 OF 2

Mean of two data sets combined

THE TRAP

47. Averaging the two means, $\frac{32+62}{2}$, only works when both sets have the same number of buildings. Here A has more, so the answer leans toward 32.

ANSWER **44**

06

MODULE 2 · Q15 · ADVANCED MATH

Which one must be an integer?

The expression $4x^2 + bx - 45$, where b is a constant, can be rewritten as $(hx + k)(x + j)$, where h, k, and j are integer constants. Which of the following must be an integer?

A $\frac{b}{h}$

B $\frac{b}{k}$

C $\frac{45}{h}$

D $\frac{45}{k}$

Try it first. *My working is on the next page.*

MY WORKING · 1 OF 2

06 Which one must be an integer?

THE KEY IDEA

Rewritten means both sides are equal for **every** x. That's a job for a Desmos regression.

1. Type both sides into Desmos. Change x to x_1, and change the equals sign to a tilde ($\sim$).

$$4x_1^2 + bx_1 - 45 \sim (hx_1 + k)(x_1 + j)$$

2. It has to work for any x, so let Desmos pick 10 random values.

$$x_1 = \text{random}(10)$$

3. Desmos finds one set that works: $b = -41$, $h = 4$, $k = -45$, $j = 1$. Now test each choice. Is it a whole number?

4. $\frac{b}{h}$, $\frac{b}{k}$ and $\frac{45}{h}$ all come out as decimals, so A, B and C are out. $\frac{45}{k} = -1$.

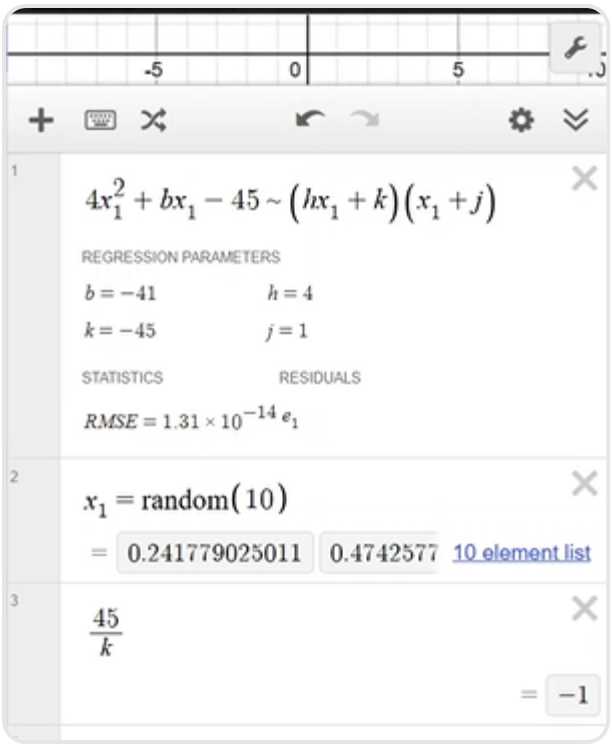
$$\frac{45}{k} = -1$$

My working continues on the next page ↓

06

MY WORKING · 2 OF 2

Which one must be an integer?



FROM THE VIDEO The tilde line finds b, h, k and j. Then $\frac{45}{k} = -1$.

THE TRAP

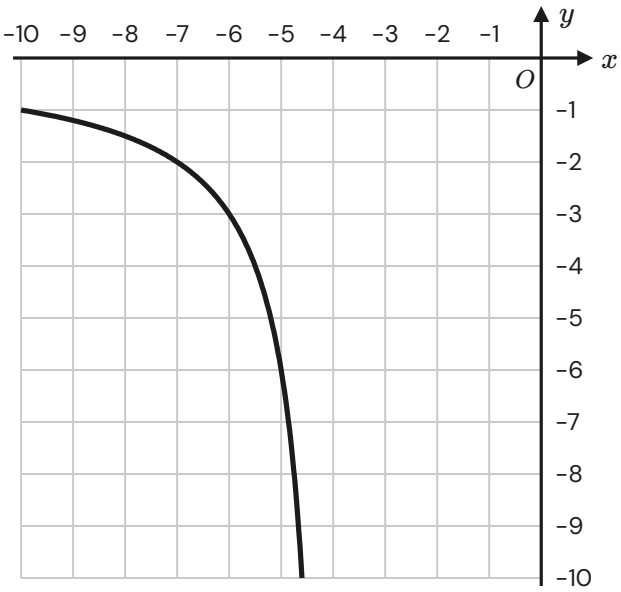
Thinking -1 isn't an integer. Negative whole numbers **are** integers.

ANSWER **D.** $\frac{45}{k}$

07

MODULE 2 · Q18 · ADVANCED MATH

Read the graph, then shift it



The rational function f is defined by an equation in the form $f(x) = \frac{a}{x+b}$, where a and b are constants. The partial graph of $y = f(x)$ is shown. If $g(x) = f(x + 4)$, which equation could define function g?

(A) $g(x) = \dfrac{6}{x}$

(B) $g(x) = \dfrac{6}{x + 4}$

(C) $g(x) = \dfrac{6}{x + 8}$

(D) $g(x) = \dfrac{6(x + 4)}{x + 4}$

Try it first. *My working is on the next page.*

07

MY WORKING · 1 OF 2

Read the graph, then shift it

THE KEY IDEA

Two unknowns, a and b, so **two points from the graph** are enough for a regression.

1. Zoom in on the graph. It passes right through two grid points. Put them in a Desmos table.

$$(-7,\ -2) \quad \text{and} \quad (-6,\ -3)$$

2. Fit the form the question gives you. Desmos finds $a = 6$ and $b = 4$.

$$y_1 \sim \frac{a}{x_1 + b}$$

3. Now type $f(x)$, then $g(x) = f(x + 4)$. That's the graph we need to match.

$$f(x) = \frac{a}{x + b}$$

$$g(x) = f(x + 4)$$

4. Type each choice and see which one lands exactly on g. A and B don't. C sits right on top of it.

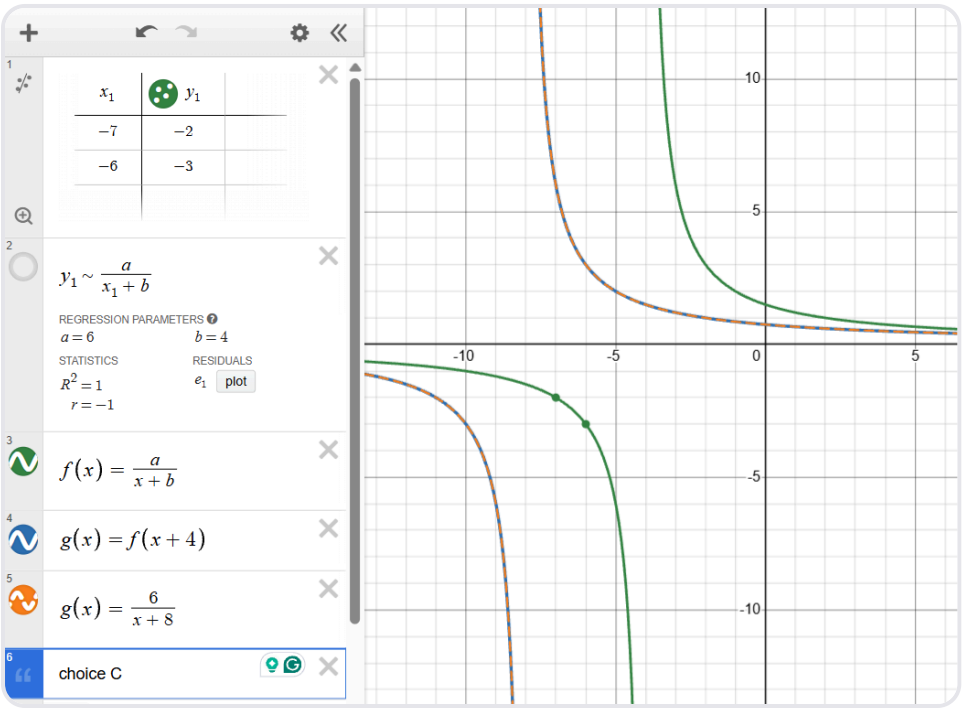
$$g(x) = \frac{6}{x + 8}$$

My working continues on the next page ↓

07

MY WORKING · 2 OF 2

Read the graph, then shift it



FROM THE VIDEO Green is f. Blue is $g(x) = f(x+4)$. Orange is choice C, right on top of it.

THE TRAP

B. $\frac{6}{x+4}$ is f itself, the graph you started with. Adding 4 inside moves it 4 more to the left.

ANSWER **C.** $g(x) = \frac{6}{x+8}$

08

MODULE 2 · Q19 · ADVANCED MATH

Product of the solutions

$$57x^2 + (57b + a)x + ab = 0$$

In the given equation, a and b are positive constants. The product of the solutions to the given equation is kab, where k is a constant. What is the value of k?

A $\frac{1}{57}$

B $\frac{1}{19}$

C 1

D 57

Try it first. *My working is on the next page.*

08

MY WORKING

Product of the solutions

THE KEY IDEA

Quadratic + **product of the solutions**: for $ax^2 + bx + c = 0$, the product is always $\frac{c}{a}$.

1. Match it up. Careful, the letters clash. The number in front of x^2 is 57, and the term without x is ab.

$$\text{product} = \frac{c}{a} = \frac{ab}{57}$$

2. The question says the product is kab. Set them equal.

$$kab = \frac{ab}{57}$$

3. Divide both sides by ab. You can do this one by hand. It's faster than Desmos.

$$k = \frac{1}{57}$$

THE TRAP

Using the **sum** rule, $-\frac{b}{a}$, by mistake. And mixing up the question's a and b with the a, b, c in the formula.

ANSWER **A.** $\frac{1}{57}$

09

MODULE 2 · Q21 · GEOMETRY AND TRIGONOMETRY

Glue two prisms together

Two identical rectangular prisms each have a height of 90 centimeters (cm). The base of each prism is a square, and the surface area of each prism is K cm^2. If the prisms are glued together along a square base, the resulting prism has a surface area of $\frac{92}{47}K$ cm^2. What is the side length, in cm, of each square base?

A 4

B 8

C 9

D 16

Try it first. *My working is on the next page.*

09

MY WORKING · 1 OF 2

Glue two prisms together

THE KEY IDEA

Write the surface area **twice**, once for one prism and once for the glued one. Two equations, two unknowns, so Desmos can solve it.

1. Sketch one prism and call the side of the square x. Surface area means every face: 2 squares (x^2 each) plus 4 rectangles (90 by x).

$$K = 2x^2 + 4(90x)$$

2. Glue two together on a square. The glued squares disappear inside, so you still have only 2 squares. The height is now 180, so each of the 4 rectangles is $180x$.

$$2x^2 + 4(180x) = \frac{92}{47}K$$

3. Type both equations into Desmos. You get two vertical lines: $x = 0$ and $x = 8$.

$$x = 0 \quad \text{or} \quad x = 8$$

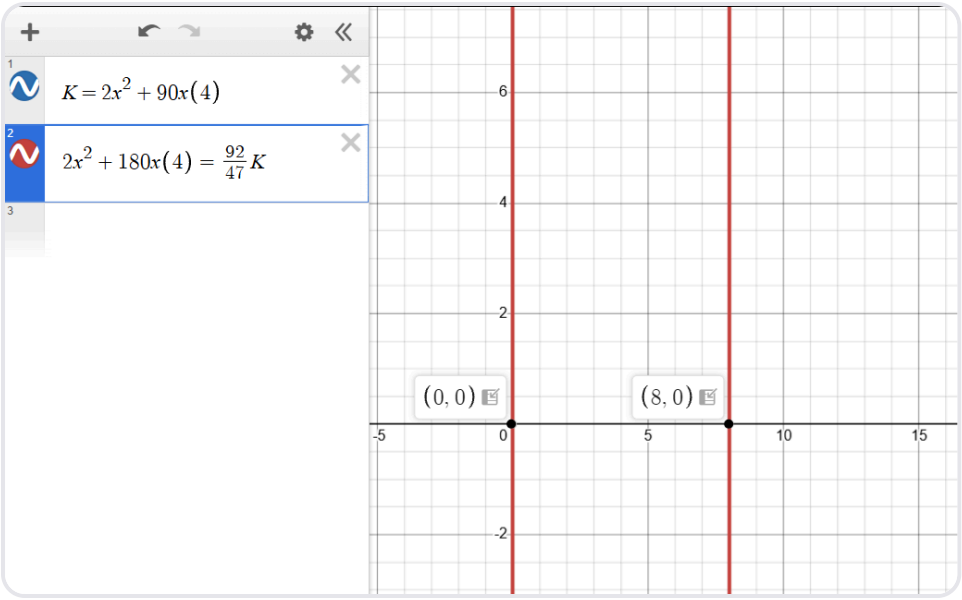
4. A side length can't be 0, so $x = 8$.

My working continues on the next page ↓

09

MY WORKING · 2 OF 2

Glue two prisms together



FROM THE VIDEO Both equations in Desmos. The lines land at $x = 0$ and $x = 8$.

THE TRAP

Counting **4** squares on the glued prism. The two glued faces are inside now, so they're not part of the surface.

ANSWER **B. 8**

10

MODULE 2 · Q22 · ADVANCED MATH

Vertex given. Which a + b + c could it be?

In the xy-plane, a parabola has vertex $(9, -14)$ and intersects the x-axis at two points. If the equation of the parabola is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants, which of the following could be the value of $a + b + c$?

A -23

B -19

C -14

D -12

Try it first. *My working is on the next page.*

10

MY WORKING · 1 OF 2

Vertex given. Which a + b + c could it be?

THE KEY IDEA

Vertex given? Start from **vertex form**. It crosses the x-axis twice with the vertex below it, so it opens up: $a > 0$. "Could be" means many answers work.

1. Vertex form with the vertex $(9, -14)$ plugged in:

$$y = a(x - 9)^2 - 14$$

2. Sketch it. $(9, -14)$ is in quadrant 4, below the x-axis. A downward parabola from there never reaches the x-axis, so it has to open up. That means $a > 0$.

3. Let Desmos expand it. Regression form: x to x_1, equals to tilde, and random values for x_1. Then type $a + b + c$.

$$a(x_1 - 9)^2 - 14 \sim ax_1^2 + bx_1 + c$$

$$x_1 = \text{random}(10)$$

4. The first answer isn't a choice, so make a a slider from 0 to 1. As a goes down, $a + b + c$ goes down, and it passes -12. So -12 is possible.

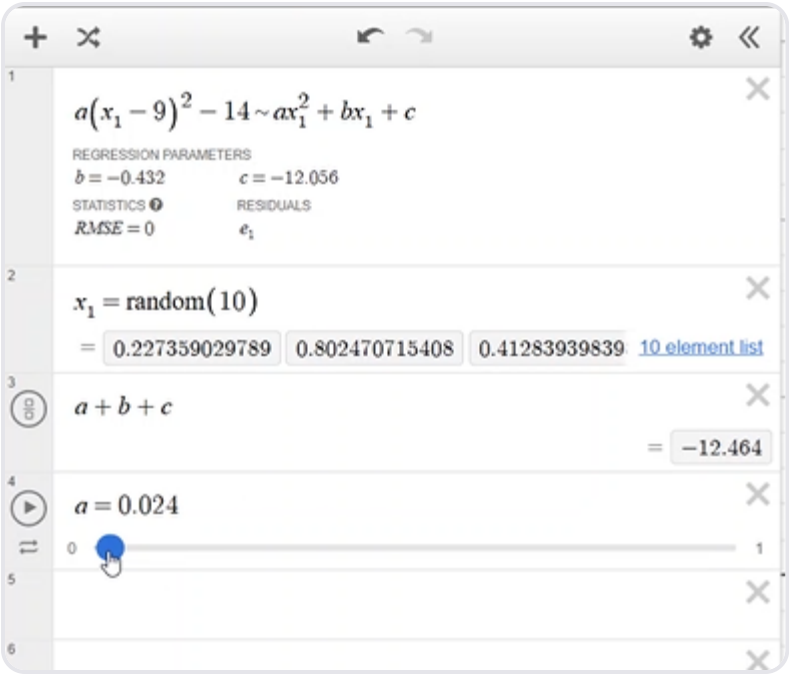
My working continues on the next page ↓

10

MY WORKING · 2 OF 2

Vertex given. Which a + b + c could it be?

5 It can never reach -14: that needs $a = 0$, and a has to be positive. So $a + b + c > -14$, and only D works.



FROM THE VIDEO Slide a down toward 0 and $a + b + c$ passes -12.

THE TRAP

C, -14. That needs $a = 0$, which isn't a parabola at all.

ANSWER **D. -12**

ANSWER KEY

01	Similar triangles, then tan	**B.** $\frac{5}{12}$
02	Shift the line, find the x-intercept	$\frac{59}{9}$ **(or 6.555, 6.556)**
03	Growth every 18 months	**C. 4**
04	When does it have no real solutions?	**289**
05	Mean of two data sets combined	**44**
06	Which one must be an integer?	**D.** $\frac{45}{k}$
07	Read the graph, then shift it	**C.** $g(x) = \frac{6}{x+8}$
08	Product of the solutions	**A.** $\frac{1}{57}$
09	Glue two prisms together	**B. 8**
10	Vertex given. Which a + b + c could it be?	**D.** -12

THE 750 GUARANTEE

750 in SAT Math, or I teach you free until you get there.

1-on-1 with a tutor who scored 800, even if math has always been hard. Not everyone qualifies. Your free 25-minute diagnosis shows if you do.

See if you qualify →

satmathwithtan.com