MATHMASTER PRO

Algebra 1 & Geometry — Core Exam
High-Frequency Problems Students Most Commonly Miss
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Name:	_____	Date:	_____	Score:	_____ / 20

Instructions: Each question has 3 steps. Circle the best answer for each step. All 3 steps must be correct to earn full credit for that question. Show all work in the space provided. Calculators are NOT permitted on the Algebra section. Use pi = 3.14 where required.

SECTION 1 — ALGEBRA 1 (Questions A1–A10)

A1 Linear Equations — Solving One-Step

Core

CONCEPT

A linear equation has the variable with exponent 1. Use inverse operations to isolate the variable. Whatever you do to one side, do to the other side.

EXAMPLE

Solve: 3x + 5 = 20

Answer: 3x = 20 - 5 = 15 => x = 15 / 3 = 5

Step 1 of 3

Solve for x: 2x + 6 = 14

(A) A) x = 2 (B) B) x = 3

(C) C) x = 4 (D) D) x = 10

Work area:

Explanation: Subtract 6 from both sides: 2x = 8. Divide by 2: x = 4.

Answer: C

Step 2 of 3

Solve for x: 5x - 10 = 15

(A) A) x = 1 (B) B) x = 3

(C) C) x = 5 (D) D) x = 25

Work area:

Explanation: Add 10: 5x = 25. Divide by 5: x = 5.

Answer: C

Step 3 of 3

Solve for x: x/4 + 3 = 7

(A) A) x = 1 (B) B) x = 8

(C) C) x = 16 (D) D) x = 28

Work area:

Explanation: Subtract 3: x/4 = 4. Multiply by 4: x = 16.

Answer: C

A2 Slope — Identifying & Calculating

■ High Frequency

CONCEPT

Slope (m) = rise/run = (y2-y1)/(x2-x1). Positive slope rises left to right. Negative slope falls. Undefined slope is vertical. Zero slope is horizontal.

EXAMPLE

Find slope between (2,3) and (6,11)

Answer: m = (11-3)/(6-2) = 8/4 = 2

Step 1 of 3

Find the slope between (1, 2) and (4, 8).

(A) A) 1 (B) B) 2

(C) C) 3 (D) D) 4

Work area:

Explanation: m = (8-2)/(4-1) = 6/3 = 2.

Answer: B

Step 2 of 3

What is the slope of y = -3x + 7 ?

(A) A) 7 (B) B) 3

(C) C) -3 (D) D) -7

Work area:

Explanation: In y = mx + b, m is the slope. Here m = -3.

Answer: C

Step 3 of 3

Which line has the STEEPEST slope?

(A) A) y=2x (B) B) y=-5x

(C) C) y=0.5x (D) D) y=x

Work area:

Explanation: Steepness = |slope|. |-5| = 5 is largest.

Answer: B

A3 Systems of Equations — Substitution

■ High Frequency

CONCEPT

A system of equations requires values satisfying both simultaneously. Substitution: solve one equation for a variable, substitute into the other.

EXAMPLE

Solve: y = 2x and x + y = 9

Answer: x + 2x = 9 => 3x = 9 => x = 3, y = 6

Step 1 of 3

Given y = x + 2 and 2x + y = 11, find x.

(A) A) 1 (B) B) 2

Work area:

(C) C) 3 (D) D) 4

Explanation: Substitute: 2x + (x+2) = 11 => 3x = 9 => x = 3.

Answer: C

Step 2 of 3

Solve: y = 3x and x + y = 16. What is y?

(A) A) 4 (B) B) 8

Work area:

(C) C) 12 (D) D) 16

Explanation: x + 3x = 16 => x = 4, y = 12.

Answer: C

Step 3 of 3

Which pair satisfies x + y = 5 and x - y = 1 ?

(A) A) (2,3) (B) B) (3,2)

Work area:

(C) C) (4,1) (D) D) (5,0)

Explanation: Adding equations: 2x = 6 => x = 3, y = 2.

Answer: B

A4 Exponent Rules

■ High Frequency

CONCEPT

Product: a^m * a^n = a^(m+n). Power: (a^m)^n = a^(mn). Quotient: a^m / a^n = a^(m-n). Zero exponent: a^0 = 1.

EXAMPLE

Simplify: x^3 * x^4

Answer: x^(3+4) = x^7

Step 1 of 3

Simplify: x^5 * x^3

(A) A) x^8 (B) B) x^15

(C) C) x^2 (D) D) 2x^8

Work area:

Explanation: Product rule: 5+3 = 8, so x^8.

Answer: A

Step 2 of 3

Simplify: (x^3)^4

(A) A) x^7 (B) B) x^12

(C) C) x^34 (D) D) 4x^3

Work area:

Explanation: Power rule: 3 x 4 = 12, so x^12.

Answer: B

Step 3 of 3

Simplify: x^8 / x^3

(A) A) x^5 (B) B) x^11

(C) C) x^24 (D) D) x^2

Work area:

Explanation: Quotient rule: 8-3 = 5, so x^5.

Answer: A

A5 Quadratic Equations — Factoring

■ High Frequency

CONCEPT

To factor x^2 + bx + c, find two numbers that multiply to c and add to b. Write as (x+p)(x+q) and set each factor equal to 0 to find solutions.

EXAMPLE

Solve: x^2 + 5x + 6 = 0

Answer: (x+2)(x+3) = 0 => x = -2 or x = -3

Step 1 of 3

Factor: x^2 + 7x + 12

(A) A) (x+3)(x+4) (B) B) (x+2)(x+6)

(C) C) (x+1)(x+12) (D) D) (x+6)(x+2)

Work area:

Explanation: 3 x 4 = 12 and 3+4 = 7. So (x+3)(x+4).

Answer: A

Step 2 of 3

Solve: x^2 - 5x + 6 = 0

(A) A) x=1,6 (B) B) x=2,3

(C) C) x=-2,-3 (D) D) x=3,6

Work area:

Explanation: (x-2)(x-3) = 0 => x = 2 or x = 3.

Answer: B

Step 3 of 3

What are the zeros of f(x) = x^2 - 9 ?

(A) A) x=9 (B) B) x=3 only

(C) C) x=+-3 (D) D) x=+-9

Work area:

Explanation: x^2 = 9 => x = +-3. Difference of squares.

Answer: C

A6 Inequalities — Solving & Graphing

Core

CONCEPT

Solve like an equation, but FLIP the inequality sign when multiplying or dividing by a negative number.

EXAMPLE

Solve: -3x < 12

Answer: Divide by -3 and flip: x > -4

Step 1 of 3

Solve: 2x + 3 > 11

(A) A) x > 4 (B) B) x < 4

(C) C) x > 7 (D) D) x < 7

Work area:

Explanation: 2x > 8 => x > 4. No flip (divided by positive 2).

Answer: A

Step 2 of 3

Solve: -4x >= 20

(A) A) x >= -5 (B) B) x <= -5

(C) C) x >= 5 (D) D) x <= 5

Work area:

Explanation: Divide by -4 and flip >= to <=: x <= -5.

Answer: B

Step 3 of 3

Which value is NOT a solution to 3x - 1 < 8 ?

(A) A) x=0 (B) B) x=2

(C) C) x=3 (D) D) x=-1

Work area:

Explanation: 3(3)-1 = 8, which is NOT < 8 (it equals 8).

Answer: C

A7 Functions — Domain, Range & Notation

Core

CONCEPT

A function assigns exactly one output to each input. Domain = all valid x-values. Range = all possible y-values. f(x) means "function of x".

EXAMPLE

If f(x) = 2x + 1, find f(3)

Answer: f(3) = 2(3) + 1 = 7

Step 1 of 3

If f(x) = 3x - 4, what is f(5)?

(A) A) 7 (B) B) 9

Work area:

(C) C) 11 (D) D) 19

Explanation: f(5) = 3(5)-4 = 15-4 = 11.

Answer: C

Step 2 of 3

Which set of ordered pairs is NOT a function?

(A) A) {(1,2),(2,3),(3,4)} (B) B) {(1,2),(1,3),(2,4)}

Work area:

(C) C) {(2,2),(3,2),(4,2)} (D) D) {(0,0),(1,1)}

Explanation: In B, x=1 maps to two y-values (2 and 3). Not a function.

Answer: B

Step 3 of 3

What is the domain of f(x) = sqrt(x - 3) ?

(A) A) x > 3 (B) B) x >= 3

Work area:

(C) C) x <= 3 (D) D) All reals

Explanation: Square root requires x-3 >= 0, so x >= 3.

Answer: B

A8 Polynomials — Adding & Multiplying

Core

CONCEPT

Combine like terms (same variable, same exponent). Multiply binomials using FOIL: First, Outer, Inner, Last.

EXAMPLE

Multiply: (x+2)(x+5)

Answer: x^2 + 5x + 2x + 10 = x^2 + 7x + 10

Step 1 of 3

Simplify: (3x^2 + 2x) + (x^2 - 5x + 1)

(A) A) 4x^2-3x+1 (B) B) 4x^2+7x+1

(C) C) 2x^2-3x (D) D) 4x^2-7x

Work area:

Explanation: (3+1)x^2 + (2-5)x + 1 = 4x^2 - 3x + 1.

Answer: A

Step 2 of 3

Expand: (x + 3)(x - 4)

(A) A) x^2+7x-12 (B) B) x^2-x-12

(C) C) x^2-7x+12 (D) D) x^2+x-12

Work area:

Explanation: FOIL: x^2 - 4x + 3x - 12 = x^2 - x - 12.

Answer: B

Step 3 of 3

What is the degree of 4x^3 - 2x^2 + x - 7 ?

(A) A) 1 (B) B) 2

(C) C) 3 (D) D) 4

Work area:

Explanation: Degree = highest exponent = 3.

Answer: C

A9 Proportions & Percent Problems

Core

CONCEPT

Proportion: a/b = c/d. Cross multiply: ad = bc. Percent formula: Part = (Percent / 100) x Whole.

EXAMPLE

What is 35% of 80?

Answer: Part = 0.35 x 80 = 28

Step 1 of 3

Solve: 3/4 = x/20

(A) A) 12 (B) B) 15

(C) C) 16 (D) D) 18

Work area:

Explanation: Cross multiply: 4x = 60 => x = 15.

Answer: B

Step 2 of 3

A $45 shirt is 20% off. What is the sale price?

(A) A) $9 (B) B) $25

(C) C) $36 (D) D) $54

Work area:

Explanation: Discount = 0.20 x 45 = $9. Sale price = 45-9 = $36.

Answer: C

Step 3 of 3

If 12 is 60% of a number, what is the number?

(A) A) 7.2 (B) B) 18

(C) C) 20 (D) D) 72

Work area:

Explanation: 12 = 0.60 x n => n = 12/0.60 = 20.

Answer: C

A10 Graphing Linear Equations — Slope-Intercept Form

Core

CONCEPT

Slope-intercept form: y = mx + b, where m = slope and b = y-intercept. To graph: plot b on y-axis, then use slope (rise/run) for more points.

EXAMPLE

Graph y = 2x - 3

Answer: y-intercept b = -3, slope m = 2 (rise 2, run 1)

Step 1 of 3

What is the y-intercept of y = -4x + 9 ?

(A) A) -4 (B) B) 4

(C) C) 9 (D) D) -9

Work area:

Explanation: In y = mx + b, b = 9 is the y-intercept.

Answer: C

Step 2 of 3

Which equation passes through (0,-2) with slope 3?

(A) A) y=3x+2 (B) B) y=-2x+3

(C) C) y=3x-2 (D) D) y=-3x+2

Work area:

Explanation: y-intercept = -2, slope = 3: y = 3x - 2.

Answer: C

Step 3 of 3

Two lines are parallel. One is y = 5x + 1. What is the slope of the other?

(A) A) -5 (B) B) 1/5

(C) C) -1/5 (D) D) 5

Work area:

Explanation: Parallel lines have equal slopes. Both = 5.

Answer: D

SECTION 2 — GEOMETRY (Questions G1–G10)

G1 Triangle Angle Sum Theorem

Core

CONCEPT

The three interior angles of ANY triangle sum to 180 degrees. If two angles are known, the third = 180 - (sum of the other two).

EXAMPLE

Triangle has 50 deg and 70 deg. Find the third.

Answer: 180 - 50 - 70 = 60 degrees

Step 1 of 3

Triangle has angles 45 deg and 85 deg. Find the third angle.

(A) A) 40 deg (B) B) 50 deg

(C) C) 60 deg (D) D) 130 deg

Work area:

Explanation: 180 - 45 - 85 = 50 degrees.

Answer: B

Step 2 of 3

Isosceles triangle with base angle 65 deg. Find the vertex angle.

(A) A) 50 deg (B) B) 55 deg

(C) C) 65 deg (D) D) 115 deg

Work area:

Explanation: Both base angles = 65. Vertex = 180 - 65 - 65 = 50 deg.

Answer: A

Step 3 of 3

What type of triangle has angles 60, 60, and 60 degrees?

(A) A) Scalene (B) B) Right

(C) C) Isosceles (D) D) Equilateral

Work area:

Explanation: All three angles are equal: equilateral triangle.

Answer: D

G2 Pythagorean Theorem

■ High Frequency

CONCEPT

In a right triangle: a^2 + b^2 = c^2, where c is the hypotenuse (longest side, opposite the right angle). Common triples: 3-4-5, 5-12-13.

EXAMPLE

Legs: 6 and 8. Find hypotenuse.

Answer: c^2 = 36 + 64 = 100 => c = 10

Step 1 of 3

Right triangle with legs 3 and 4. Find the hypotenuse.

(A) A) 5 (B) B) 6

Work area:

(C) C) 7 (D) D) 12

Explanation: 3^2 + 4^2 = 9 + 16 = 25 => c = 5. Classic 3-4-5 triple.

Answer: A

Step 2 of 3

A 13-ft ladder leans against a wall, base 5 ft away. How high does it reach?

(A) A) 8 ft (B) B) 10 ft

Work area:

(C) C) 12 ft (D) D) 18 ft

Explanation: h^2 = 13^2 - 5^2 = 169 - 25 = 144 => h = 12 ft.

Answer: C

Step 3 of 3

Is a triangle with sides 7, 24, 25 a right triangle?

(A) A) Yes, 7^2+24^2=25^2 (B) B) No

Work area:

(C) C) Yes, equilateral (D) D) Cannot determine

Explanation: 49 + 576 = 625 = 25^2. Yes, it is a right triangle.

Answer: A

G3 Area & Perimeter of Common Shapes

Core

CONCEPT

Rectangle: A=lw, P=2(l+w). Triangle: A=(1/2)bh. Circle: A=pi*r^2, C=2*pi*r. Parallelogram: A=bh.

EXAMPLE

Area of triangle: base=10, height=6

Answer: A = (1/2) x 10 x 6 = 30 sq units

Step 1 of 3

Rectangle with length 8 and width 5. What is the area?

(A) A) 13 (B) B) 26

Work area:

(C) C) 40 (D) D) 80

Explanation: A = 8 x 5 = 40 sq units.

Answer: C

Step 2 of 3

Circle with radius 7. Area? (Use pi = 3.14)

(A) A) 21.98 (B) B) 43.96

Work area:

(C) C) 153.86 (D) D) 615.44

Explanation: A = 3.14 x 7^2 = 3.14 x 49 = 153.86.

Answer: C

Step 3 of 3

Perimeter of a triangle with sides 5, 12, and 13.

(A) A) 25 (B) B) 30

Work area:

(C) C) 60 (D) D) 78

Explanation: P = 5 + 12 + 13 = 30.

Answer: B

G4 Parallel Lines & Transversals

■ High Frequency

CONCEPT

Alternate interior angles: equal. Corresponding angles: equal. Co-interior (same-side interior) angles: supplementary (sum = 180 deg).

EXAMPLE

Corresponding angles: one = 65 deg. Find the other.

Answer: Corresponding angles are equal: 65 degrees

Step 1 of 3

Alternate interior angle is 72 deg. What is the other alternate interior angle?

(A) A) 18 deg (B) B) 72 deg

Work area:

(C) C) 108 deg (D) D) 180 deg

Explanation: Alternate interior angles are congruent: 72 deg.

Answer: B

Step 2 of 3

Co-interior angles on the same side of a transversal sum to:

(A) A) 90 deg (B) B) 180 deg

Work area:

(C) C) 270 deg (D) D) 360 deg

Explanation: Co-interior (same-side interior) angles are supplementary: 180 deg.

Answer: B

Step 3 of 3

Corresponding angles: (3x+10) deg and 70 deg. Find x.

(A) A) 10 (B) B) 20

Work area:

(C) C) 30 (D) D) 60

Explanation: 3x + 10 = 70 => 3x = 60 => x = 20.

Answer: B

G5 Volume of 3D Shapes

■ High Frequency

CONCEPT

Prism: V=lwh. Cylinder: V=pi*r^2*h. Cone: V=(1/3)*pi*r^2*h. Sphere: V=(4/3)*pi*r^3. Pyramid: V=(1/3)*B*h.

EXAMPLE

Volume of cylinder: r=3, h=10

Answer: V = pi x 9 x 10 approx 282.6 cubic units

Step 1 of 3

Rectangular prism: l=6, w=4, h=3. What is the volume?

(A) A) 13 (B) B) 36

Work area:

(C) C) 72 (D) D) 144

Explanation: V = 6 x 4 x 3 = 72 cubic units.

Answer: C

Step 2 of 3

Cone: radius=3, height=9. Volume approx? (pi=3.14)

(A) A) 84.78 (B) B) 254.34

Work area:

(C) C) 28.26 (D) D) 169.56

Explanation: V = (1/3) x 3.14 x 9 x 9 = (1/3) x 254.34 = 84.78.

Answer: A

Step 3 of 3

Cylinder volume = 120 cm^3. Same r and h cone volume = ?

(A) A) 30 cm^3 (B) B) 40 cm^3

Work area:

(C) C) 60 cm^3 (D) D) 360 cm^3

Explanation: Cone = (1/3) x cylinder = 120/3 = 40 cm^3.

Answer: B

G6 Similarity & Congruence

Core

CONCEPT

Congruent figures: same shape AND size. Similar figures: same shape, different sizes. Corresponding sides are proportional.

EXAMPLE

Similar triangles: sides 3,4,5 and 6,8,x. Find x.

Answer: Scale factor = 2, so x = 10

Step 1 of 3

Similar triangles, scale factor 3. Small side = 7. Large side = ?

(A) A) 7 (B) B) 14

Work area:

(C) C) 21 (D) D) 49

Explanation: 7 x 3 = 21.

Answer: C

Step 2 of 3

Triangle ABC = Triangle DEF. AB=5, BC=7, DE=5. What is EF?

(A) A) 5 cm (B) B) 7 cm

Work area:

(C) C) 12 cm (D) D) 35 cm

Explanation: Congruent: corresponding sides equal. BC corresponds to EF = 7 cm.

Answer: B

Step 3 of 3

Similar figures with area ratio 9:25. Side length ratio = ?

(A) A) 3:5 (B) B) 9:25

Work area:

(C) C) 81:625 (D) D) 3:25

Explanation: Area ratio = (side ratio)^2. sqrt(9/25) = 3/5.

Answer: A

G7 Coordinate Geometry — Distance & Midpoint

Core

CONCEPT

Distance: d = sqrt[(x2-x1)^2 + (y2-y1)^2]. Midpoint: M = ((x1+x2)/2 , (y1+y2)/2).

EXAMPLE

Distance between (1,2) and (4,6)

Answer: d = sqrt(9+16) = sqrt(25) = 5

Step 1 of 3

Distance between (0,0) and (3,4) = ?

(A) A) 3.5 (B) B) 5

(C) C) 7 (D) D) 12

Work area:

Explanation: d = sqrt(9+16) = sqrt(25) = 5.

Answer: B

Step 2 of 3

Midpoint of (2,6) and (8,10) = ?

(A) A) (3,8) (B) B) (5,8)

(C) C) (6,5) (D) D) (10,16)

Work area:

Explanation: M = ((2+8)/2, (6+10)/2) = (5,8).

Answer: B

Step 3 of 3

Midpoint of AB = (4,3). A = (1,1). Find B.

(A) A) (5,4) (B) B) (7,5)

(C) C) (3,2) (D) D) (8,6)

Work area:

Explanation: (1+Bx)/2=4 => Bx=7. (1+By)/2=3 => By=5. B=(7,5).

Answer: B

G8 Transformations — Translation, Rotation, Reflection

Core

CONCEPT

Translation: (x+a, y+b). Reflect over x-axis: (x,-y). Reflect over y-axis: (-x,y). Rotate 90 deg CCW: (-y,x). Rotate 180 deg: (-x,-y).

EXAMPLE

Reflect (3, -2) over x-axis

Answer: (3, 2) — flip y-coordinate

Step 1 of 3

Point A=(3,5) translated by (-2,+4). New position?

(A) A) (1,9) (B) B) (5,1)

(C) C) (3,9) (D) D) (1,1)

Work area:

Explanation: (3+(-2), 5+4) = (1,9).

Answer: A

Step 2 of 3

Reflect (4,-3) over the y-axis.

(A) A) (4,3) (B) B) (-4,-3)

(C) C) (-4,3) (D) D) (3,4)

Work area:

Explanation: y-axis reflection: negate x, keep y => (-4,-3).

Answer: B

Step 3 of 3

Rotate (2,5) by 90 deg counterclockwise about origin.

(A) A) (5,2) (B) B) (-5,2)

(C) C) (2,-5) (D) D) (5,-2)

Work area:

Explanation: 90 CCW: (x,y) => (-y,x) = (-5,2).

Answer: B

G9 Circle Theorems — Arcs & Inscribed Angles

■ High Frequency

CONCEPT

Inscribed angle = (1/2) x central angle for same arc. Arc length L = (theta/360) x 2*pi*r. Diameter subtends a 90-deg inscribed angle (Thales).

EXAMPLE

Central angle = 120 deg. Find inscribed angle.

Answer: Inscribed angle = 120/2 = 60 degrees

Step 1 of 3

Central angle = 100 deg. Inscribed angle for same arc = ?

(A) A) 25 deg (B) B) 50 deg

Work area:

(C) C) 100 deg (D) D) 200 deg

Explanation: Inscribed angle = (1/2) x 100 = 50 deg.

Answer: B

Step 2 of 3

Angle inscribed in a semicircle (diameter as chord) measures:

(A) A) 45 deg (B) B) 60 deg

Work area:

(C) C) 90 deg (D) D) 180 deg

Explanation: Thales' theorem: inscribed angle in semicircle = 90 deg.

Answer: C

Step 3 of 3

Circle radius=10, central angle=72 deg. Arc length? (pi=3.14)

(A) A) 4 pi (B) B) 12.56

Work area:

(C) C) 25.12 (D) D) 62.8

Explanation: L = (72/360) x 2 x 3.14 x 10 = 0.2 x 62.8 = 12.56.

Answer: B

G10 Special Right Triangles — 45-45-90 & 30-60-90

■ High Frequency

CONCEPT

45-45-90: legs = x, hypotenuse = x*sqrt(2). 30-60-90: short leg = x, long leg = x*sqrt(3), hypotenuse = 2x.

EXAMPLE

45-45-90, leg = 5. Find hypotenuse.

Answer: hypotenuse = 5*sqrt(2) approx 7.07

Step 1 of 3

45-45-90 triangle, one leg = 8. Hypotenuse = ?

(A) A) 4 sqrt(2) (B) B) 8 sqrt(2)

Work area:

(C) C) 16 (D) D) 8 sqrt(3)

Explanation: Hypotenuse = 8*sqrt(2). Multiply leg by sqrt(2).

Answer: B

Step 2 of 3

30-60-90 triangle, short leg = 6. Long leg = ?

(A) A) 3 sqrt(2) (B) B) 6 sqrt(2)

Work area:

(C) C) 6 sqrt(3) (D) D) 12

Explanation: Long leg = short leg x sqrt(3) = 6*sqrt(3).

Answer: C

Step 3 of 3

30-60-90 triangle, hypotenuse = 14. Short leg = ?

(A) A) 7 (B) B) 7 sqrt(2)

Work area:

(C) C) 7 sqrt(3) (D) D) 14 sqrt(3)

Explanation: Short leg = hypotenuse / 2 = 14/2 = 7.

Answer: A

ANSWER KEY

Algebra 1

Q	Step 1	Step 2	Step 3
A1	C	C	C
A2	B	C	B
A3	C	C	B
A4	A	B	A
A5	A	B	C
A6	A	B	C
A7	C	B	B
A8	A	B	C
A9	B	C	C
A10	C	C	D

Geometry

Q	Step 1	Step 2	Step 3
G1	B	A	D
G2	A	C	A
G3	C	C	B
G4	B	B	B
G5	C	A	B
G6	C	B	A
G7	B	B	B
G8	A	B	B
G9	B	C	B
G10	B	C	A

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