

# Math Mastery Worksheet

Algebra 2 & Geometry | High-Yield Practice Problems

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## ALGEBRA 2

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Q01 | Quadratic Functions

Which of the following is the vertex form of  $f(x) = x^2 - 6x + 5$ ?

■ *VERTEX FORM: complete the square  $\rightarrow (x-h)^2 + k$*

- A.  $(x-3)^2 - 4$
  - B.  $(x-3)^2 + 4$
  - C.  $(x+3)^2 - 4$
  - D.  $(x-6)^2 + 5$
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Q02 | Polynomial Operations — Remainder Theorem

What is the remainder when  $p(x) = 2x^3 - 3x^2 + x - 5$  is divided by  $(x - 2)$ ?

■ *REMAINDER THEOREM: plug in the zero  $\rightarrow p(2) = \text{remainder}$*

- A. -3
  - B. 1
  - C. 5
  - D. 9
- 

Q03 | Rational Exponents

Simplify:  $27^{(2/3)}$

■ *RATIONAL EXPONENT: denominator = root, numerator = power*

- A. 3
  - B. 9
  - C. 18
  - D. 81
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Q04 | Logarithms

Solve for  $x$ :  $\log_3(x+2) + \log_3(x-2) = 3$

■ *LOG PRODUCT:  $\log A + \log B = \log(AB)$ , then convert to exponential form*

- A.  $x = 3$
  - B.  $x = \sqrt{31}$
  - C.  $x = \pm 5$
  - D.  $x = 27$
- 

Q05 | Complex Numbers

What is  $(3 + 2i)(1 - 4i)$  in the form  $a + bi$ ?

■ FOIL + REMEMBER:  $i^2 = -1$ , replace and combine real/imaginary parts

- A.  $3 - 10i$
  - B.  $11 - 10i$
  - C.  $-5 - 10i$
  - D.  $11 + 10i$
- 

Q06 | Systems of Equations

How many solutions does this system have?

$$y = x^2 - 4$$

$$y = 2x - 1$$

■ SUBSTITUTE & DISCRIMINANT: set equal  $\rightarrow D = b^2 - 4ac$ .  $D > 0$  means 2 solutions

- A. No solution
  - B. Exactly 1
  - C. Exactly 2
  - D. Infinitely many
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Q07 | Sequences & Series

Find the sum of the first 8 terms of the geometric sequence 3, 6, 12, 24, ...

■ GEO SUM:  $S_n = a_1 * (r^n - 1)/(r - 1)$ , identify  $r$  first

- A. 381
  - B. 765
  - C. 768
  - D. 384
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Q08 | Inverse Functions

If  $f(x) = (2x+1)/(x-3)$ , what is  $f^{-1}(x)$ ?

■ INVERSE SWAP: swap  $x$  &  $y$ , then isolate  $y$

- A.  $(3x+1)/(x-2)$
  - B.  $(x-3)/(2x+1)$
  - C.  $(2x-1)/(x+3)$
  - D.  $(x+1)/(x-2)$
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Q09 | Conic Sections — Parabola

The equation  $x^2 - 4x - 8y + 4 = 0$  represents a parabola. What is the vertex?

■ PARABOLA VERTEX: complete the square in  $x \rightarrow (x-h)^2 = 4p(y-k)$ , vertex =  $(h,k)$

- A. (2, 0)
  - B. (2, 1)
  - C. (-2, 0)
  - D. (4, 0)
- 

Q10 | Matrices — Determinant

If  $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ , what is  $\det(A)$  and does  $A^{-1}$  exist?

■ **DETERMINANT:**  $ad - bc$ . If  $\det \neq 0$ , inverse exists

- A.  $\det=0$ ; no inverse
  - B.  $\det=5$ ; inverse exists
  - C.  $\det=11$ ; inverse exists
  - D.  $\det=14$ ; inverse exists
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# GEOMETRY

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Q01 | Triangle Congruence

Two triangles have two pairs of equal sides and the included angle equal. Which congruence rule applies?

■ *CONGRUENCE: SSS | SAS | ASA | AAS | HL — 'included' = between the two sides*

- A. SSS
  - B. SAS
  - C. ASA
  - D. AAS
- 

Q02 | Circle Theorems

An inscribed angle intercepts an arc of 140 degrees. What is the measure of the inscribed angle?

■ *INSCRIBED ANGLE = 1/2 x intercepted arc*

- A. 280 degrees
  - B. 140 degrees
  - C. 70 degrees
  - D. 35 degrees
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Q03 | Similarity & Scale

Two similar triangles have a side-length ratio of 2:5. What is the ratio of their areas?

■ *SCALE FACTOR: sides -> k, areas -> k<sup>2</sup>, volumes -> k<sup>3</sup>*

- A. 2:5
  - B. 4:25
  - C. 4:10
  - D. 8:125
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Q04 | Right Triangles — Pythagorean Theorem

In a right triangle, the two legs are 5 and 12. What is the hypotenuse?

■ *PYTHAGOREAN: a<sup>2</sup> + b<sup>2</sup> = c<sup>2</sup>. Triples: (3,4,5) (5,12,13) (8,15,17)*

- A. 13
  - B. 17
  - C. sqrt(119)
  - D. 15
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Q05 | Coordinate Geometry

What is the equation of the perpendicular bisector of the segment with endpoints A(2,4) and B(6,8)?

■ *PERP BISECTOR: find midpoint + slope = -1/m of original segment*

- A.  $y = x + 2$

- B.  $y = -x + 10$
  - C.  $y = x - 2$
  - D.  $y = -x + 6$
- 

Q06 | Parallel Lines & Transversals

Two parallel lines are cut by a transversal. Co-interior angles are  $(3x+10)$  and  $(5x-30)$ . Find  $x$ .

■ *CO-INTERIOR (same-side interior): add to 180 degrees — NOT equal*

- A.  $x = 20$
  - B.  $x = 25$
  - C.  $x = 25.25$
  - D.  $x = 100$
- 

Q07 | Volume — Cone vs Cylinder

A cone and a cylinder share the same base radius  $r=4$  and height  $h=9$ . What is the ratio of cone's volume to cylinder's volume?

■ *CONE vs CYLINDER: cone =  $(1/3) \pi r^2 h$ , cylinder =  $\pi r^2 h$  -> ratio always 1:3*

- A. 1:9
  - B. 1:3
  - C. 1:2
  - D. 3:1
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Q08 | Trigonometry — Right Triangles

In a right triangle,  $\sin(\theta) = 3/5$ . What is  $\cos(\theta)$ ?

■ *SOH-CAH-TOA + PYTHAGOREAN ID:  $\sin^2 + \cos^2 = 1$*

- A.  $4/5$
  - B.  $3/4$
  - C.  $5/4$
  - D.  $2/5$
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Q09 | Quadrilaterals — Parallelogram

The diagonals of a parallelogram bisect each other. If one diagonal has endpoints  $(1,3)$  and  $(7,11)$ , what is the midpoint of the other diagonal?

■ *PARALLELOGRAM: diagonals bisect each other -> share the same midpoint*

- A.  $(3,5)$
  - B.  $(4,7)$
  - C.  $(6,8)$
  - D.  $(8,14)$
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Q10 | Transformations

Point  $P(3, -2)$  is rotated 90 degrees counter-clockwise about the origin. What are the new coordinates?

■ *ROTATION 90 CCW:  $(x, y) \rightarrow (-y, x)$ . CW:  $(x, y) \rightarrow (y, -x)$*

- A. (-2, -3)
  - B. (2, 3)
  - C. (-3, 2)
  - D. (2, -3)
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# Answer Key

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## Algebra 2

Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10
A	B	B	B	B	C	B	A	A	B

## Geometry

Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10
B	C	B	A	B	B	B	A	B	B

Good luck! Review the memory tags for each topic you miss.