

# Algebra 2 & Geometry

Essential Practice Problems — Print Edition

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Section: Algebra 2 / Geometry

Score: \_\_\_\_\_ / 20

Difficulty:  Easy

Medium

Hard

## ALGEBRA 2 — Problems A-01 through A-10

### A-01 Quadratic Equations

★ *DISCRIMINANT:*  $b^2 - 4ac > 0 = \text{two real roots}$   $= 0 = \text{one root}$   $< 0 = \text{no real roots}$

Which equation has **no real solutions**?

(A)  $x^2 - 5x + 6 = 0$

(B)  $x^2 - 4 = 0$

(C)  $x^2 + x + 2 = 0$

(D)  $2x^2 - 3x = 0$

Answer: ( \_\_\_\_\_ )

### A-02 Vertex Form

★ *VERTEX FORM:*  $y = a(x-h)^2 + k \rightarrow \text{vertex is at } (h, k)$

The parabola  $y = 2(x-3)^2 + 5$  has its vertex at:

(A) (-3, 5)

(B) (3, 5)

(C) (3, -5)

(D) (5, 3)

Answer: ( \_\_\_\_\_ )

### A-03 Logarithms

★ *LOG PRODUCT RULE:*  $\log(a) + \log(b) = \log(ab)$   $\log_b(b^n) = n$

Simplify:  $\log_2(8) + \log_2(4)$

(A) 6

(B) 4

(C) 7

(D) 5

Answer: ( \_\_\_\_\_ )

**A-04** Remainder Theorem

★ *REMAINDER THEOREM:  $f(a)$  = remainder when  $f(x)$  is divided by  $(x - a)$*

When  $f(x) = x^3 - 2x + 5$  is divided by  $(x - 2)$ , the remainder is:

(A) 3	(B) 7
(C) 9	(D) 1

Answer: ( \_\_\_\_\_ )

**A-05** Complex Numbers

★ *KEY FACT:  $i^2 = -1 \rightarrow$  FOIL, then substitute  $i^2 = -1$*

What is  $(3 + 2i)(1 - i)$ ?

(A) $5 - i$	(B) $3 - i$
(C) $5 + i$	(D) $1 - i$

Answer: ( \_\_\_\_\_ )

**A-06** Exponential Functions

★ *DECAY:  $y = a \cdot b^x$  with  $0 < b < 1$  | GROWTH:  $b > 1$*

Which function represents **exponential decay**?

(A) $y = 3 \cdot 2^x$	(B) $y = 5 \cdot (0.4)^x$
(C) $y = 2^x + 1$	(D) $y = -3^x$

Answer: ( \_\_\_\_\_ )

**A-07** Arithmetic Sequences

★  *$n$ th TERM:  $a_n = a_1 + (n-1)d$   $d$  = common difference*

The 15th term of 3, 7, 11, 15, ... is:

(A) 55	(B) 57
(C) 59	(D) 61

Answer: ( \_\_\_\_\_ )

**A-08** Rational Functions

★ *VERTICAL ASYMPTOTE: set denominator = 0 (after canceling common factors)*

What are the vertical asymptote(s) of  $f(x) = (x+1) / (x^2 - 9)$ ?

(A) $x = 1$	(B) $x = 9$
(C) $x = 3$ only	(D) $x = 3$ and $x = -3$

Answer: ( \_\_\_\_\_ )

**A-09** Inverse Functions



★ *INVERSE: swap  $x$  and  $y \rightarrow$  solve for  $y \rightarrow$  write as  $f^{-1}(x)$*

If  $f(x) = 2x - 6$ , then  $f^{-1}(x) =$

(A) $(x + 2) / 6$	(B) $(x + 6) / 2$
(C) $2x + 6$	(D) $1 / (2x - 6)$

Answer: ( \_\_\_\_\_ )

**A-10** Systems of Equations



★ *SUBSTITUTION: set both  $y$ -expressions equal  $\rightarrow$  solve the resulting equation*

Solve:  $y = x^2 - 4$  and  $y = x - 2$ . The solutions are:

(A) $(2, 0)$ and $(-1, -3)$	(B) $(2, 0)$ only
(C) $(1, -1)$ and $(-2, -4)$	(D) No solution

Answer: ( \_\_\_\_\_ )

## GEOMETRY — Problems G-01 through G-10

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### G-01 Triangle Angle Sum

★ TRIANGLE SUM: All three interior angles always add up to  $180^\circ$

In a triangle, two angles measure  $47^\circ$  and  $83^\circ$ . The third angle is:

(A) $40^\circ$	(B) $45^\circ$
(C) $50^\circ$	(D) $60^\circ$

Answer: ( \_\_\_\_\_ )

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### G-02 Pythagorean Theorem

★  $a^2 + b^2 = c^2$   $c =$  hypotenuse (the longest side, opposite the right angle)

A right triangle has legs of length 6 and 8. The hypotenuse is:

(A) 12	(B) 10
(C) 14	(D) 7

Answer: ( \_\_\_\_\_ )

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### G-03 Circle — Arc Length

★ ARC LENGTH =  $(\text{theta} / 360) \times 2\pi r$  central angle = intercepted arc (degrees)

A central angle of  $120^\circ$  is in a circle with radius 9. The arc length is:

(A) $6\pi$	(B) $3\pi$
(C) $9\pi$	(D) $12\pi$

Answer: ( \_\_\_\_\_ )

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### G-04 Similar Triangles

★ SIMILARITY RATIO: corresponding sides are proportional AA  $\rightarrow$  similar

Triangles ABC and DEF are similar with ratio 3:5. If  $AB = 12$ , then  $DE =$

(A) 15	(B) 18
(C) 20	(D) 36

Answer: ( \_\_\_\_\_ )

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### G-05 Coordinate Geometry — Midpoint

★ MIDPOINT:  $M = ((x_1+x_2)/2, (y_1+y_2)/2)$

Find the midpoint of the segment with endpoints (-2, 6) and (8, -4).

(A) (3, 2)	(B) (6, 2)
(C) (2, 3)	(D) (3, 1)

Answer: ( \_\_\_\_\_ )

**G-06** Parallel Lines & Transversals

★ *ALTERNATE INTERIOR angles are EQUAL when lines are parallel*

Parallel lines cut by a transversal. Alternate interior angles:  $(3x+10)^\circ$  and  $(5x-14)^\circ$ . Find  $x$ .

(A) $x = 10$	(B) $x = 12$
(C) $x = 6$	(D) $x = 8$

Answer: ( \_\_\_\_\_ )

**G-07** Volume — Cone

★ *CONE VOLUME:  $V = (1/3) \times \pi \times r^2 \times h$  (one-third of a cylinder)*

A cone has radius 3 and height 7. Its volume is:

(A) $21\pi$	(B) $63\pi$
(C) $9\pi$	(D) $42\pi$

Answer: ( \_\_\_\_\_ )

**G-08** Inscribed Angle Theorem

★ *INSCRIBED ANGLE =  $(1/2) \times$  intercepted arc Central angle = arc*

An inscribed angle intercepts an arc of  $140^\circ$ . The inscribed angle measures:

(A) $140^\circ$	(B) $280^\circ$
(C) $70^\circ$	(D) $35^\circ$

Answer: ( \_\_\_\_\_ )

**G-09** Reflections

★ *Reflect over y-axis  $\rightarrow$  negate x:  $(x, y) \rightarrow (-x, y)$  over x-axis  $\rightarrow$  negate y*

Point P(4, -3) is reflected across the y-axis. New coordinates:

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

Answer: ( \_\_\_\_\_ )

**G-10**

## Special Right Triangles



★ 30-60-90:  $x, x\sqrt{3}, 2x$  | 45-45-90:  $x, x, x\sqrt{2}$

In a 30-60-90 triangle with hypotenuse 16, the shorter leg is:

(A) 8	(B) $8\sqrt{3}$
(C) $8\sqrt{2}$	(D) 4

Answer: ( \_\_\_\_\_ )

## ANSWER KEY

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### ALGEBRA 2

A-01: C	A-01: B	A-01: D	A-01: C	A-01: A
A-02: B	A-02: C	A-02: D	A-02: B	A-02: A

### GEOMETRY

G-01: C	G-01: B	G-01: A	G-01: C	G-01: D
G-02: B	G-02: A	G-02: C	G-02: B	G-02: A

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### QUICK EXPLANATIONS

A-01 (C)	$b^2-4ac = 1-8 = -7 < 0 \rightarrow$ no real roots
A-02 (B)	Vertex form $y=a(x-h)^2+k$ gives vertex $(h,k) = (3,5)$
A-03 (D)	$\log_2(8)=3, \log_2(4)=2, \text{sum}=5$
A-04 (C)	$f(2) = 8 - 4 + 5 = 9$ (Remainder Theorem)
A-05 (A)	$(3+2i)(1-i) = 3-3i+2i-2i^2 = 3-i+2 = 5-i$
A-06 (B)	Base 0.4 is between 0 and 1 $\rightarrow$ decay
A-07 (C)	$a_{15} = 3+(14 \times 4) = 3+56 = 59$
A-08 (D)	$x^2-9=(x-3)(x+3)=0 \rightarrow x=3$ and $x=-3$
A-09 (B)	Swap $x$ & $y$ ;: $x=2y-6 \rightarrow y=(x+6)/2$
A-10 (A)	$x^2-x-2=0 \rightarrow (x-2)(x+1)=0 \rightarrow x=2$ or $x=-1 \rightarrow (2,0)$ and $(-1,-3)$
G-01 (C)	$180-47-83 = 50^\circ$
G-02 (B)	$\sqrt{(36+64)} = \sqrt{100} = 10$ (6-8-10 triple)
G-03 (A)	$(120/360) \times 2\pi \times 9 = (1/3) \times 18\pi = 6\pi$
G-04 (C)	$12/DE = 3/5 \rightarrow DE=20$
G-05 (D)	$M = ((-2+8)/2, (6-4)/2) = (3, 1)$
G-06 (B)	$3x+10=5x-14 \rightarrow 24=2x \rightarrow x=12$
G-07 (A)	$(1/3) \times \pi \times 9 \times 7 = 21\pi$
G-08 (C)	Inscribed angle = $(1/2) \times 140^\circ = 70^\circ$
G-09 (B)	Reflect over $y$ -axis: negate $x \rightarrow (-4, -3)$
G-10 (A)	30-60-90: hyp=2x, $x=8$ ; shorter leg=8