Algebra 2 & Geometry

Study Workbook · 20 Core Problems · Print & Practice

PART I — ALGEBRA 2

A1 · Quadratic Formula · Discriminant

■ DISCRIMINANT: b²−4ac > 0 → two roots | = 0 → one root | < 0 → no real roots

Example: x²−5x+6=0 → D=25−24=1>0 → two real roots (x=3, x=2)

How many real solutions does $2x^2 - 4x + 5 = 0$ have?

[Discriminant = $b^2 - 4ac = (-4)^2 - 4(2)(5)$]

A) Two distinct real solutions

B) Exactly one real solution

C) No real solutions ✓

D) Infinitely many solutions

A2 · Vertex Form · Completing the Square

■ VERTEX FORM: y = a(x−h)² + k → vertex is (h, k). Watch the SIGN of h!

Example: y=(x−3)²+2 → vertex (3,2). The minus sign means h=+3, not −3.

The parabola $y = -2(x + 1)^2 - 4$ has its vertex at which point?

A) (1, −4)

B) (−1, −4) ✓

C) (−1, 4)

D) (1, 4)

A3 · Logarithm Laws

■ LOG RULES: log(AB)=logA+logB · log(A/B)=logA−logB · log(A■)=n·logA

Example: log■(8x³) = log■8 + log■(x³) = 3 + 3log■x

Which expression is equal to $\log_■(27x^2)$?

A) 3 + log■x

B) 27 + 2log■x

C) 3 + 2log■x ✓

D) 6log■x

A4 · Exponential Equations · Same Base Method

■ SAME BASE: if a■ = a■ then x = y. Convert both sides to same base first!

Example: 4■ = 8 → (2²)■ = 2³ → 2x = 3 → x = 3/2

Solve for x: $9■■^{1} = 27$

A) x = 1

B) x = 1/2 ✓

C) x = 2

D) x = 3/2

A5 · Rational Expressions · Domain Restrictions

■ UNDEFINED: set denominator = 0, solve → those values are EXCLUDED from domain

What value(s) of x must be excluded from the domain of

(x + 3) / (x² – x – 6)?

A) x = –3 only

B) x = 3 only

C) x = 3 and x = –2 ✓

D) x = –3 and x = 2

A6 · Function Composition · f(g(x))

■ COMPOSITION: f(g(x)) = plug g(x) INTO f. Work INSIDE OUT.

Example: f(x)=x²+1, g(x)=2x → f(g(x))=f(2x)=(2x)²+1=4x²+1

Given f(x) = 3x – 1 and g(x) = x², what is f(g(2))?

A) 10

B) 25

C) 11 ✓

D) 5

A7 · Arithmetic Sequences · nth Term

■ ARITHMETIC: a■ = a■ + (n–1)d · Find d first, then use (n–1), NOT n!

The first term is 7, common difference is –3.

What is the 15th term? [a■ = a■ + (n–1)d]

A) –28

B) –35 ✓

C) –42

D) –32

A8 · Systems of Equations · Elimination

■ ELIMINATION: make coefficients equal → ADD or SUBTRACT to cancel a variable

Solve the system:

3x + 2y = 12

5x – 2y = 4

A) x=2, y=3 ✓

B) x=3, y=2

C) x=1, y=4.5

D) x=2, y=–3

A9 · Polynomial Division · Remainder Theorem

■ REMAINDER THEOREM: remainder of f(x)÷(x–a) = f(a). Just PLUG IN a!

Example: f(x)=x³–2x+1 divided by (x–2): remainder = f(2)=8–4+1=5

What is the remainder when f(x) = 2x³ + x² – 5x + 3 is divided by (x – 1)?

A) 0

B) 3

C) 1 ✓

D) –1

A10 · Complex Numbers · i² = –1

■ IMAGINARY: i=√(–1), i²=–1, i³=–i, i■=1 → cycle repeats every 4!

Simplify: (3 + 2i)(1 – 4i)

[Use FOIL, then replace i^2 with -1]

A) $3 - 10i$ B) $11 + 10i$

C) $11 - 10i$ ✓ D) $-5 - 10i$

ANSWER KEY — Algebra 2

A1: C	A2: B	A3: C	A4: B	A5: C
A6: C	A7: B	A8: A	A9: C	A10: C

PART II — GEOMETRY

G1 · Triangle Similarity · AA Postulate

■ AA SIMILARITY: 2 equal angles → similar triangles → sides PROPORTIONAL

Example: If ■ABC ~ ■DEF with ratio 1:3, and AB=5, then DE=15.

Similar triangles: smaller sides are 4, 6, 8. Longest side of larger = 20.

What is the shortest side of the larger triangle?

A) 8 B) 10 ✓

C) 12 D) 15

G2 · Special Right Triangles · 30-60-90 / 45-45-90

■ 30-60-90: sides = x, x√3, 2x (hyp=2×short!) · 45-45-90: x, x, x√2

In a 30-60-90 triangle, the hypotenuse is 14.

What is the length of the side opposite the 30° angle?

A) $14\sqrt{3}$ B) $7\sqrt{3}$

C) 7 ✓ D) $7\sqrt{2}$

G3 · Circle Theorems · Inscribed Angle

■ INSCRIBED ANGLE = ½ × intercepted arc · CENTRAL ANGLE = full arc (ratio 1:2)

Example: arc AB = 80° → inscribed angle = 40°, central angle = 80°

An inscribed angle intercepts an arc of 110°.

What is the measure of the inscribed angle?

A) 110° B) 220°

C) 70° D) 55° ✓

G4 · Area of Composite Figures

■ COMPOSITE: BREAK into simple shapes → ADD or SUBTRACT their areas

A rectangle (10 cm × 8 cm) with a semicircle (diameter 10 cm) on top.

Total area? ($\pi \approx 3.14$)

[Area = (l×w) + ($\pi r^2/2$)]

A) 118.25 cm²

B) 119.25 cm² ✓

C) 157.00 cm²

D) 141.30 cm²

G5 · Volume of Solids · Cone Formula

■ CONE = ■ of same cylinder · V = (1/3)$\pi r^2 h$ · Don't forget the 1/3!

A cone: radius = 6 cm, height = 9 cm. What is its volume? ($\pi \approx 3.14$)

A) 1017.36 cm³

B) 339.12 cm³ ✓

C) 508.68 cm³

D) 452.16 cm³

G6 · Parallel Lines · Transversal Angles

■ PARALLEL LINES: alternate interior=EQUAL · co-interior=180° · corresponding=EQUAL

Parallel lines cut by a transversal. One co-interior angle = 73°.

What is the other co-interior angle?

A) 73°

B) 17°

C) 107° ✓

D) 37°

G7 · Coordinate Geometry · Midpoint Formula

■ MIDPOINT: average the x's AND the y's → M = ((x■+x■)/2, (y■+y■)/2)

Point A(–2, 5) and Point B(6, –3).

What is the midpoint of segment AB?

A) (4, 2)

B) (2, 1) ✓

C) (2, –1)

D) (–2, 1)

G8 · Polygon Interior Angles · Sum Formula

■ SUM = (n–2) × 180° · each angle in REGULAR polygon = sum ÷ n

What is the measure of each interior angle of a regular octagon?

[(n–2) × 180° ÷ n]

A) 120°

B) 144°

C) 135° ✓

D) 150°

G9 · Trigonometry · SOH-CAH-TOA

■ SOH: sin=opp/hyp · CAH: cos=adj/hyp · TOA: tan=opp/adj

Example: θ=30°, hyp=10 → opp = 10×sin30° = 10×0.5 = 5

Right triangle: angle = 40°, adjacent side = 12.

Find the hypotenuse. (cos 40° ≈ 0.766)

A) 7.7

B) 14.3

C) 15.7 ✓

D) 18.6

G10 · Transformations · Rotation Rules

■ 90° CCW: (x,y)→(–y,x) · 180°: (x,y)→(–x,–y) · 270° CCW: (x,y)→(y,–x)

Point P(3, –5) is rotated 180° about the origin.

What are the new coordinates?

A) (5, 3)

B) (3, 5)

C) (–3, 5) ✓

D) (5, –3)

ANSWER KEY — Geometry

G1: B	G2: C	G3: D	G4: B	G5: B
G6: C	G7: B	G8: C	G9: C	G10: C

✓ = correct answer marked in each option set above