

# Algebra 2 & Geometry

Core Problems — Print Edition · Self-Study Worksheet

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## Part I — Algebra 2

### Q01 · Quadratic Formula

MEMORY:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$  | 'negative b, plus-minus root, over 2a'

**Solve:  $2x^2 - 7x + 3 = 0$**

A)  $x = 1, x = 3/2$

B)  $x = 3, x = 1/2$  ✓

C)  $x = -3, x = -1/2$

D)  $x = 7/4, x = 0$

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### Q02 · Complex Numbers

MEMORY:  $i^2 = -1$  always. Treat  $i$  like a variable, then replace  $i^2$  with  $-1$ .

**Simplify:  $(3 + 2i)(1 - 4i)$**

A)  $3 - 8i^2$

B)  $-5 + 10i$

C)  $11 - 10i$  ✓

D)  $3 - 10i$

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### Q03 · Logarithms

MEMORY:  $\log =$  exponent.  $\log_b(x)=y$  means  $b^y=x$ . Quotient rule:  $\log(A/B) = \log A - \log B$

**Evaluate:  $\log_3(81) - \log_3(9)$**

A) 1

B) 3

C) 2 ✓

D) 9

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### Q04 · Polynomial Factoring — Difference of Cubes

MEMORY:  $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$  | SOAP: Same · Opposite · Always Positive

**Factor completely:  $8x^3 - 27$**

A)  $(2x-3)^3$

B)  $(2x-3)(4x^2+6x+9)$  ✓

C)  $(2x+3)(4x^2-6x+9)$

D)  $(2x-3)(4x^2-9)$

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### Q05 · Rational Expressions

MEMORY: Dividing fractions  $\rightarrow$  KCF: Keep · Change · Flip (multiply by reciprocal)

**Simplify:  $(x^2-4)/(x^2-x-6) \div (x+2)/(x-3)$**

A)  $(x+2)/(x+3)$

B)  $x-2$

C) 1 ✓

D)  $(x-2)(x-3)/(x+3)$

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Q06 · Exponential Growth

MEMORY:  $A = P(2)^{(t/d)}$  where  $d$  = doubling period. Count the doublings first!

**A population of 500 bacteria doubles every 3 hours. How many after 9 hours?**

- A) 2,000  
B) 3,000  
C) 4,000 ✓  
D) 1,500
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Q07 · Systems of Equations

MEMORY: Substitution = replace one variable with expression from other equation.

**Solve:  $3x + 2y = 12$  and  $x - y = 1$**

- A) (2, 3)  
B) (14/5, 9/5) ✓  
C) (1, 0)  
D) (3, 2)
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Q08 · Vertex Form of a Parabola

MEMORY:  $y = a(x-h)^2 + k \rightarrow$  vertex =  $(h, k)$ . Sign FLIPS:  $(x+3)$  means  $h = -3$ !

**What is the vertex of  $y = 2(x + 3)^2 - 5$  ?**

- A) (3, -5)  
B) (-3, -5) ✓  
C) (-3, 5)  
D) (3, 5)
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Q09 · Arithmetic Sequences

MEMORY:  $a_n = a_1 + (n-1)d$  | 'First term + steps  $\times$  step size'

**The 5th term is 23 and common difference is 4. Find the 1st term.**

- A) 3  
B) 7 ✓  
C) 11  
D) 19
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Q10 · Rational Exponents

MEMORY:  $x^{(m/n)} = (n\text{-th root of } x)^m$  | Denominator = ROOT, Numerator = POWER

**Evaluate:  $27^{(4/3)}$**

- A) 9  
B) 36  
C) 81 ✓  
D) 108
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## Part II — Geometry

Q11 · Pythagorean Theorem

MEMORY:  $a^2 + b^2 = c^2$  | Common triples: 3-4-5, 5-12-13, 7-24-25

**A right triangle has legs 7 and 24. Find the hypotenuse.**

- A) 31  
B)  $\sqrt{575}$   
C) 25 ✓  
D) 26
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Q12 · Circle — Arc Length

MEMORY:  $Arc\ Length = (\theta/360) \times 2\pi \cdot r$  | 'Fraction of circle  $\times$  circumference'

**Circle with radius 10. Find arc length of a  $72^\circ$  central angle. (Use pi)**

- A)  $4\pi \approx 12.57$  ✓  
B)  $20\pi \approx 62.8$   
C)  $2\pi \approx 6.28$   
D)  $8\pi \approx 25.13$
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Q13 · Triangle Similarity — Area Ratio

MEMORY:  $Area\ ratio = (Side\ ratio)^2$  | Linear  $\rightarrow$  square the ratio for AREA!

**Similar triangles with side ratio 3:5. Smaller area =  $27\text{ cm}^2$ . Find larger area.**

- A)  $45\text{ cm}^2$   
B)  $75\text{ cm}^2$  ✓  
C)  $135\text{ cm}^2$   
D)  $50\text{ cm}^2$
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Q14 · Volume of a Cone

MEMORY:  $V = (1/3)\pi \cdot r^2 \cdot h$  | 'Cone gets 1/3 of the cylinder's volume'

**Cone with radius 6 cm and height 10 cm. Find volume (in terms of pi).**

- A)  $180\pi\text{ cm}^3$   
B)  $360\pi\text{ cm}^3$   
C)  $120\pi\text{ cm}^3$  ✓  
D)  $60\pi\text{ cm}^3$
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Q15 · Coordinate Geometry — Midpoint

MEMORY:  $Midpoint\ M = ((x_1+x_2)/2, (y_1+y_2)/2)$  | 'Average of x's, average of y's'

**M(3,-1) is the midpoint of AB. If A=(7,5), find B.**

- A) (10, 4)  
B) (-1, -7) ✓  
C) (5, 2)  
D) (1, -7)
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Q16 · Parallel Lines & Transversals

MEMORY:  $Co\text{-interior angles} = SUPPLEMENTARY$  (sum to  $180^\circ$ ).  $Alternate\ interior = EQUAL$ .

**Co-interior angles:  $(3x+10)^\circ$  and  $(2x+20)^\circ$ . Find x.**

- A)  $x = 20$   
B)  $x = 25$   
C)  $x = 30$  ✓  
D)  $x = 15$
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Q17 · Special Right Triangles (45-45-90)

MEMORY: 45-45-90 sides:  $x, x, x\sqrt{2}$ . Hypotenuse = leg  $\times$   $\sqrt{2}$

**45-45-90 triangle with hypotenuse  $8\sqrt{2}$ . Find each leg.**

- A) 4  
B) 8 ✓  
C)  $4\sqrt{2}$   
D)  $8\sqrt{3}$
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Q18 · Circle Theorems — Inscribed Angle

MEMORY:  $Inscribed\ Angle = (1/2) \times Intercepted\ Arc$  | 'Inscribed gets half the credit'

**An inscribed angle intercepts an arc of  $140^\circ$ . Find the inscribed angle.**

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