

# Algebra 2 & Geometry

Core Practice Problems — Self-Study Workbook

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## ALGEBRA 2 — Core Problems (Q01–Q10)

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### Q01 Quadratic Functions

*Memory Point: Memory:  $y = a(x-h)^2 + k \Rightarrow$  vertex =  $(h, k)$ , NOT  $(-h, k)$*

Which of the following is the vertex of the parabola  $y = 2(x - 3)^2 + 5$ ?

- A) (-3, 5)
  - B) (3, 5)
  - C) (3, -5)
  - D) (-3, -5)
- 

### Q02 Solving Quadratics — Discriminant

*Memory Point: Memory: discriminant =  $b^2 - 4ac \Rightarrow$  (+) = 2 real, (0) = 1 real, (-) = no real solutions*

How many real solutions does  $3x^2 - 6x + 4 = 0$  have? (Hint: calculate  $b^2 - 4ac = 36 - 48 = ?$ )

- A) 0 real solutions
  - B) 1 real solution
  - C) 2 real solutions
  - D) Infinitely many
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### Q03 Polynomial End Behavior

*Memory Point: Memory: even degree  $\Rightarrow$  same direction both ends. Negative leading  $\Rightarrow$  both go DOWN.*

What is the end behavior of  $f(x) = -2x^4 + 3x^2 - 1$ ?

- A) As  $x \rightarrow +/\infty$ ,  $f(x) \rightarrow +\infty$
  - B) As  $x \rightarrow +/\infty$ ,  $f(x) \rightarrow -\infty$
  - C) As  $x \rightarrow +\infty$ ,  $f \rightarrow +\infty$ ; as  $x \rightarrow -\infty$ ,  $f \rightarrow -\infty$
  - D) As  $x \rightarrow +\infty$ ,  $f \rightarrow -\infty$ ; as  $x \rightarrow -\infty$ ,  $f \rightarrow +\infty$
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### Q04 Rational Exponents

*Memory Point: Memory:  $x^{(m/n)} = (\text{nth root of } x)^m \Rightarrow$  denominator = root index, numerator = power*

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

- A) 3
- B) 18
- C) 9

D) 81

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**Q05 Logarithms**

*Memory Point: Memory:  $\log_b(x) = y$  means  $b^y = x \Rightarrow$  'base to what power equals argument?'*

Solve for x: log base 3 of x = 4

- A) x = 12
  - B) x = 64
  - C) x = 81
  - D) x = 43
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**Q06 Exponential Growth**

*Memory Point: Memory: Exponential model = initial  $\times$  (base)<sup>time</sup>. Doubling  $\Rightarrow$  base = 2*

A population starts at 500 and doubles every year. Which equation models the population P after t years?

- A)  $P = 500 + 2t$
  - B)  $P = 500 \times 2^t$
  - C)  $P = 2 \times 500^t$
  - D)  $P = 500^{(2t)}$
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**Q07 Systems of Equations**

*Memory Point: Memory: substitution  $\Rightarrow$  plug one equation INTO the other, then solve, then back-substitute*

Solve the system:  $y = 2x + 1$  and  $3x + y = 16$

- A) (3, 7)
  - B) (5, 11)
  - C) (3, 6)
  - D) (4, 9)
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**Q08 Complex Numbers**

*Memory Point: Memory:  $i^2 = -1$ . Use FOIL then replace  $i^2$  with  $-1$  to combine real parts.*

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

- A)  $3 - 8i$
  - B)  $11 - 10i$
  - C)  $-5 + 10i$
  - D)  $3 + 10i$
- 

**Q09 Geometric Series**

*Memory Point: Memory: Geometric sum  $S_n = a(1 - r^n)/(1 - r)$ . Or just add the terms if few!*

Find the sum of the first 4 terms of the geometric sequence: 2, 6, 18, 54, ...

- A) 78
  - B) 80
  - C) 162
  - D) 60
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**Q10 Conic Sections — Ellipse**

*Memory Point: Memory: Ellipse:  $x^2/a^2 + y^2/b^2 = 1 \Rightarrow$  use HALF the axis length (semi-axis), not full length!*

Which is the equation of an ellipse with horizontal major axis of length 10 and vertical minor axis of length 6, centered at origin?

- A)  $x^2/25 + y^2/9 = 1$
  - B)  $x^2/9 + y^2/25 = 1$
  - C)  $x^2/100 + y^2/36 = 1$
  - D)  $x^2/10 + y^2/6 = 1$
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## GEOMETRY — Core Problems (G01–G10)

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### G01 Parallel Lines & Angles

*Memory Point: Memory: co-interior (same-side interior) angles are SUPPLEMENTARY => add to 180 degrees*

Two parallel lines are cut by a transversal. One co-interior angle is 72 degrees. What is the other co-interior angle?

- A) 72 degrees
  - B) 108 degrees
  - C) 118 degrees
  - D) 90 degrees
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### G02 Triangle Congruence

*Memory Point: Memory: SAS = Side-Angle-Side (angle must be BETWEEN the two sides). SSA is NOT valid!*

Two triangles have two pairs of equal sides and the INCLUDED angle (between those sides) equal. Which congruence rule applies?

- A) SSS
  - B) AAS
  - C) SAS
  - D) ASA
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### G03 Pythagorean Theorem

*Memory Point: Memory:  $a^2 + b^2 = c^2$  => c is always the HYPOTENUSE (opposite the right angle, longest side)*

A right triangle has legs of length 5 and 12. What is the length of the hypotenuse?

- A) 13
  - B) 17
  - C) 11
  - D) 169
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### G04 Circle — Inscribed Angle Theorem

*Memory Point: Memory: inscribed angle =  $1/2$  x intercepted arc. Central angle = full arc (no halving!)*

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

- A) 140 degrees
- B) 70 degrees

- C) 280 degrees
  - D) 90 degrees
- 

**G05 Area — Trapezoid**

*Memory Point: Memory: Trapezoid area =  $((b_1 + b_2) / 2) \times h \Rightarrow$  AVERAGE the two bases, then multiply by height*

Find the area of a trapezoid with bases 8 cm and 14 cm, and height 5 cm.

- A) 55 cm<sup>2</sup>
  - B) 110 cm<sup>2</sup>
  - C) 560 cm<sup>2</sup>
  - D) 22 cm<sup>2</sup>
- 

**G06 Similar Triangles**

*Memory Point: Memory: Perimeters share the SAME ratio as sides. Areas share the SQUARED ratio.*

Two similar triangles have sides in ratio 3:5. The smaller triangle has perimeter 24. What is the perimeter of the larger?

- A) 30
  - B) 40
  - C) 48
  - D) 72
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**G07 Volume — Cylinder**

*Memory Point: Memory:  $V = \pi \times r^2 \times h \Rightarrow$  use RADIUS (not diameter!). Radius = diameter / 2*

Find the volume of a cylinder with radius 3 cm and height 10 cm. ( $\pi = 3.14$ )

- A) 94.2 cm<sup>3</sup>
  - B) 282.6 cm<sup>3</sup>
  - C) 942 cm<sup>3</sup>
  - D) 30 $\pi$  cm<sup>3</sup>
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**G08 Coordinate Geometry — Midpoint**

*Memory Point: Memory: midpoint = average the x-values, average the y-values. Watch negative signs!*

What is the midpoint of the segment with endpoints (-4, 6) and (10, -2)?

- A) (3, 2)
  - B) (6, 4)
  - C) (7, -4)
  - D) (-7, 4)
- 

**G09 Transformations — Reflection**

*Memory Point: Memory: reflect over y-axis  $\Rightarrow$  flip x sign:  $(x, y) \rightarrow (-x, y)$ . y-value stays SAME.*

Point P = (4, -3) is reflected over the y-axis. What are the coordinates of P'?

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

**G10 Trigonometry — SOH-CAH-TOA**

Memory Point: Memory:  $\sin = \text{Opposite}/\text{Hypotenuse} \Rightarrow \sin 30 = 1/2, \sin 45 = \sqrt{2}/2, \sin 60 = \sqrt{3}/2$

In a right triangle, angle theta = 30 degrees and the hypotenuse = 20. Find the side OPPOSITE to theta.

- A) 10
- B)  $10\sqrt{3}$
- C)  $10\sqrt{2}$
- D) 20

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## ANSWER KEY

Algebra 2

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

Geometry

G01	G02	G03	G04	G05	G06	G07	G08	G09	G10
B	C	A	B	A	B	B	A	C	A